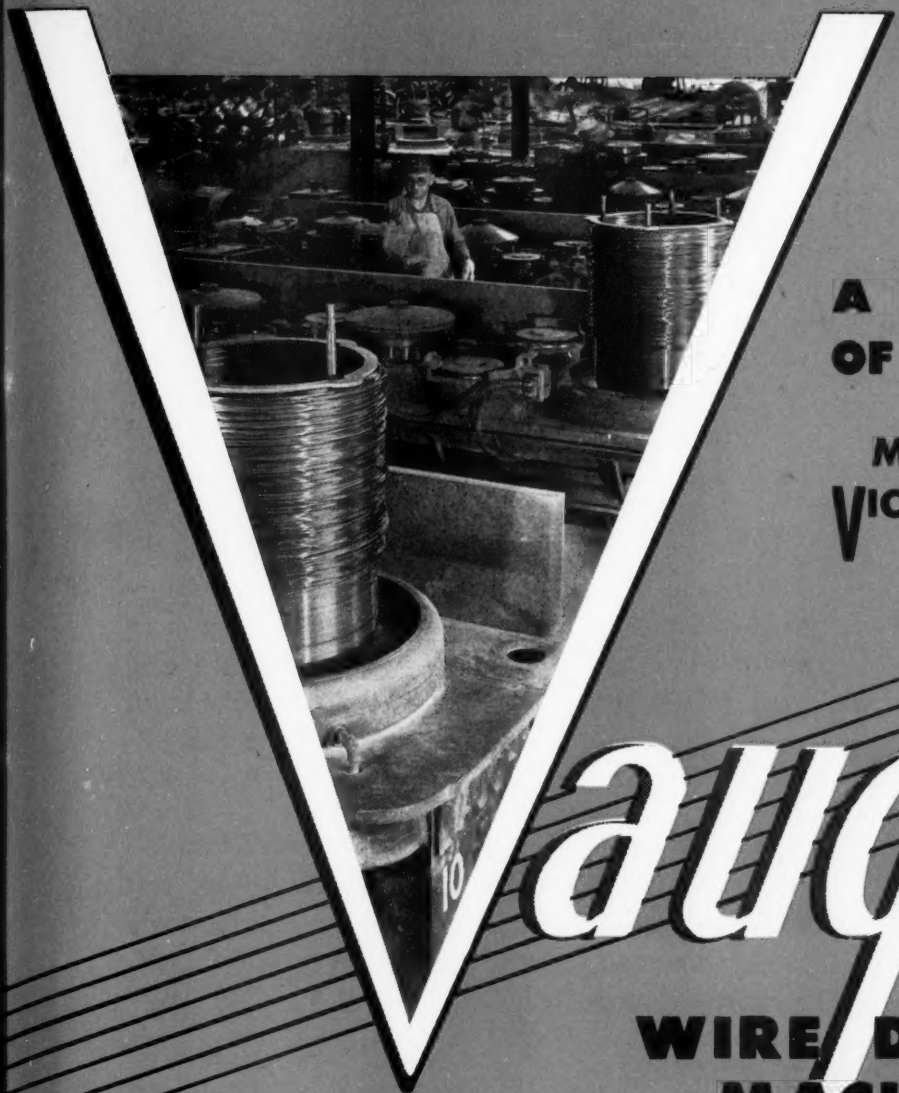
WIRE AND WIRE PRODUCTS

OCTOBER 1942



A FULL MEASURE OF *Value* • • • —

MEETING TODAY'S VICTORY STANDARDS

Vaughn

WIRE DRAWING MACHINERY

THE VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO, U. S. A.

SEE PAGES 540 A-D.

HIGHLIGHTING THE COMPLETE LINE OF VAUGHN VICTORY EQUIPMENT!

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

to the WIRE INDUSTRY

THE wire industry has stepped up production again and again to take care of the war needs of the United Nations. Wire and cable for field communications, for battleships, for tanks, for airplanes—wire and cable in huge quantities, for every branch of the combatant services has been forthcoming as needed.

We at Syncro sincerely salute the wire industry for the magnificent job it is doing—and we are proud of the part Syncro machines are playing in both the ferrous and non-ferrous wire mills and cable plants throughout the United States and Canada in turning out these essential products—on time and in sufficient quantity.

SYNCRO MACHINE COMPANY

RAHWAY, NEW JERSEY
McCORMICK BLDG., CHICAGO

REPRESENTED IN CANADA BY CANADIAN ELEVATOR EQUIPMENT CO. LTD., TORONTO

Machinery for the Wire Industry

SYNCRO

COMPLETE SERVICE FOR USERS OF CEMENTED CARBIDE DIES

STANDARD MANDRELS
SMALL ARMS AMMUNITION DIES AND LARGE SIZE SHELL DIES
STANDARD SQUARE AND HEXAGON DIES
STANDARD ROUND-HOLE WIRE, BAR AND TUBING DIES
SHAPED DIE SERVICE UNIT
COMPLETE ROUND HOLE DIE SERVICE EQUIP-MENT

DEEP DRAW DIES	SHAPE DIES	WIRE DRAWING DIES
EXTRUSION DIES	COATING DIES	TUBING MANDRELS
BOLT SIZING DIES	TUBING DIES	CARTRIDGE CASE DIES
STRANDING DIES	EYELET DIES	SPRING FORMING TOOLS
	SIZING DIES	

SEE BOOTH B-324—NATIONAL METAL SHOW

CARBOLOY COMPANY, INC.

CHICAGO • CLEVELAND • NEWARK • SEATTLE • DETROIT, MICHIGAN • LOS ANGELES • PHILADELPHIA • PITTSBURGH

Authorized Distributors: Hartley Wire Die Co., Thomaston, Conn.; Canadian General Electric Co., Ltd., Toronto, Can.

CARBOLOY CEMENTED TOOLS - DIES - DRESSERS CORE BITS - MASONRY DRILLS WEAR RESISTANT PARTS CARBIDES

Reg. U.S. Pat. Off.

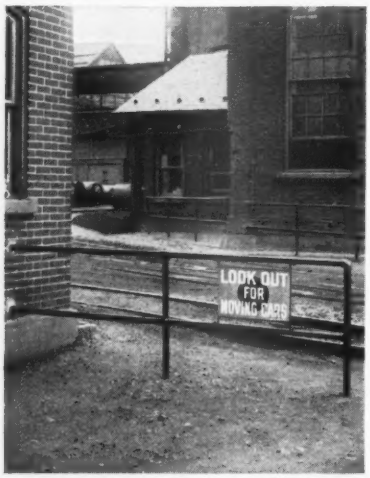
FOR THE MANUFACTURING · MINING · TRANSPORTATION · CONSTRUCTION INDUSTRIES

PROTECT the Employee and SPEED Production—

For 27 years Bethlehem has been waging war on the most dangerous saboteur of industrial production—accidents. Today, with the future of the nation so dependent upon top-speed production of war steel, we are stepping up the safety and first-aid effort on a widening scale.

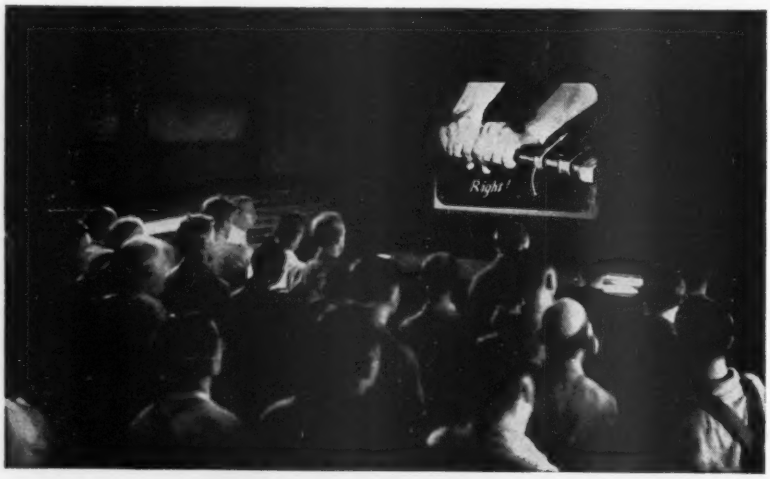
First-aid instruction is being given to thousands of employees. Established safety practices are daily being intensified. More safety shoes, goggles, helmets, respirators and fire-proof clothing. More warning signs and flags to mark danger spots. More safety posters to keep workers safety-conscious. . . . No detail is overlooked which can possibly contribute to the fast, efficient, *safe* production of steel for America's ever-growing war needs.

TOE-SAVING SHOES—Each of these five steel-reinforced safety shoes saved a foot from painful injury and kept one more worker on the job, fit, and able to continue doing his share to keep up the flow of Bethlehem's war production.



DANGER SPOT—But it's been rendered harmless by a short railing and a sign. Instead of stepping out blindly from the corner of the building, workers must cross the track at a point where they can hardly fail to notice an approaching train.

REHEARSAL—This team of first-aid men is giving treatment to an accident "victim" at one of Bethlehem's first-aid contests, held annually for many years. Thanks to this training, thousands of Bethlehem-trained first-aiders are constantly on the alert in steel plants and mines to prevent or treat industrial accidents.



BETHLEHEM STEEL

SAFETY SCHOOL—By movies and lectures, Bethlehem employees are continuously being trained in the safest, most efficient methods of handling their jobs. Year after year, this education in the safe way to do every job goes steadily forward.

1 *Large* **TONNAGE TO CLOSE TOLERANCE**

2 *Minimum* **FRICTION AND DIE WEAR**

3 *Smooth* **FINISH FREE OF SCORE MARKS**

Vascoloy RAMET

TANTALUM-TUNGSTEN CARBIDE DIES

for

DRAWING

For drawing fine wire, heavy wire, special shapes, tubing, etc. For shell and cartridge cases from the blank to completed case.

COLD HEADING

Rivets and any number of small upset parts required in large quantities to close tolerance.

COLD NOSING

Artillery shells.

EXTRUDING

For extruding operations on a wide variety of parts because of quantity and tolerance requirements.

These are the highlights in the performance of Vascoloy-Ramet Tantalum-Tungsten Carbide Dies. These too, are the reasons for converting to such dies wherever high performance must be counted on for uninterrupted day-in-and-day-out production.

Tantalum-Tungsten Carbide Dies are now used for countless forming, nosing, drawing, cupping, and extruding operations on articles of war materiel. Our special die department offers its services and experience to manufacturers making products requiring these operations.

Tell us your problems. If carbide dies can be used to advantage, we will design and produce Tantalum-Tungsten Carbide Dies that will assure you the ultimate in performance.

Ramet

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS

DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES

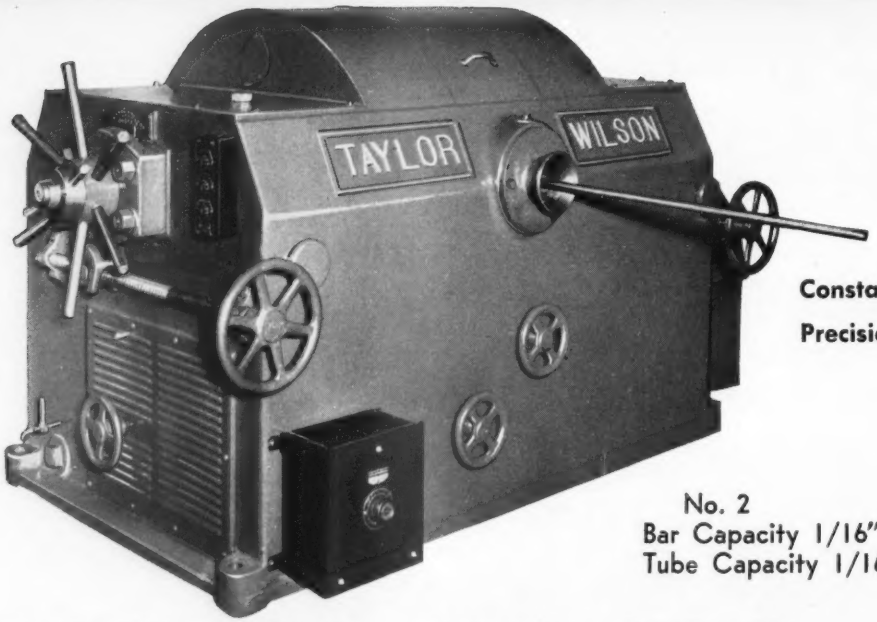
IN CANADA: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

4252

TANTALUM-TUNGSTEN CARBIDE

FOR HIGH PERFORMANCE . . . *Specify* Vascoloy RAMET **DIES**

Faster Production Greater Accuracy



Sturdy • Vibrationless

Constant Precision

No. 2
Bar Capacity 1/16" to 2½"
Tube Capacity 1/16" to 3"

TAYLOR-WILSON

Straightening - Sizing - Burnishing Machine for Round Bars and Tubing

Taylor-Wilson Machine lends itself to high speeds. Normal production in straightening ranges upward to 250 feet per minute on mild steel. On high tensile, high Brinell and other difficult steels speed of delivery is limited only by the horsepower of motor and angle of rolls. All gears, rolls and other operating parts are enclosed within the unit. Now serving with high efficiency in many war production plants throughout the nation.

Write for Literature

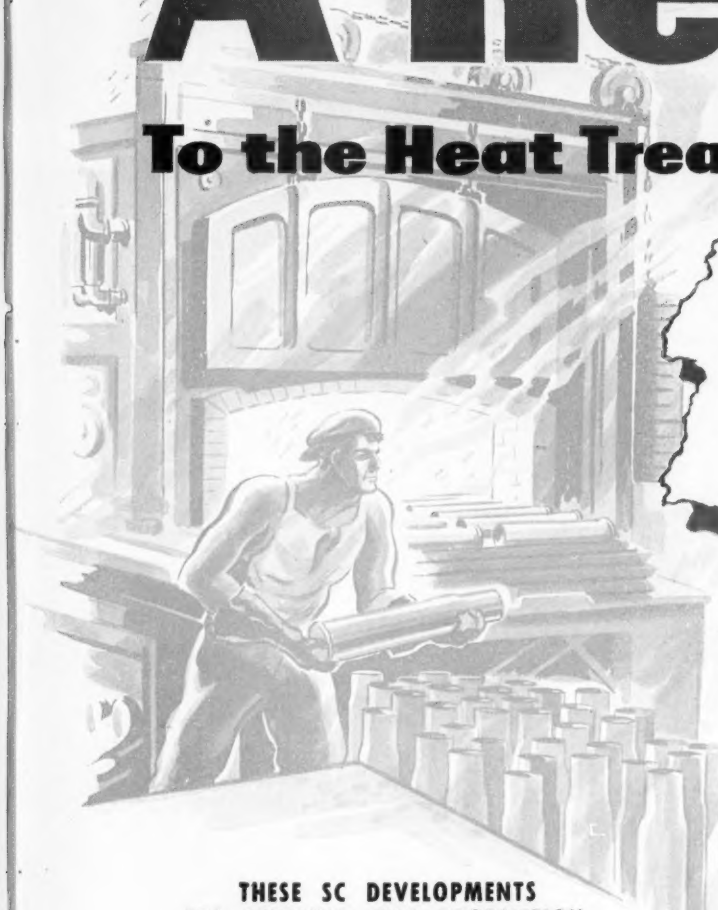
TAYLOR-WILSON MFG CO.

17 Thomson Ave. McKees Rocks, Pa.

PITTSBURGH DISTRICT

A Report

To the Heat Treaters of America



TO WIN A BATTLE OR A WAR, EQUIPMENT ALONE IS NOT ENOUGH. THE FINEST TOOLS IN THE WORLD ARE WASTED UNTIL THEY ARE PROPERLY PUT TO WORK AND THEN USED FULLY AND EFFICIENTLY

★ Today, SC Heat Treat Engineers literally live with the metal working industry.

Veterans of peace-time heat treating, these men have made themselves expert in war practice, too. Their assignment is to see to it that SC Furnaces are on the job for Victory.

SC Engineering Service goes much farther than that. Long at the forefront in applying heating in industrial problems, Surface Combustion has become a responsible clearing house on the heat treatment of armament. Its great fund of information on war materials manufacture grows steadily larger. Continuing study and research perfect treatment of new metals, advance new treatments for old ones. SC Engineers are called in to help set up new methods. And when new needs arise, SC usually has or can readily furnish the type of equipment it takes.

"Right . . . and on time." That's the principle which has governed production at Surface Combustion for more than a generation. And it applies equally well to SC Engineering Service.

THESE SC DEVELOPMENTS ARE SPEEDING WAR PRODUCTION:

1. Walking beam hardening and draw furnace for projectiles.
2. Convection type furnace for annealing cartridge cases.
3. Direct fired hardening and draw furnace for gun barrels.
4. Radiant tube bell type furnace for carburizing tank parts.
5. Convection furnace for stress relieving gun turrets, etc.
6. Forging furnace for aeroplane propellers.
7. Convection car type furnace for stress relieving weldments.
8. Rotary furnace for projectile forging.
9. Roller hearth furnaces for annealing and normalizing tubing.
10. Char-Mo furnace for hardening projectiles.
11. Rotary furnace for projectile nosing.

...And in addition, a complete line of standard and special furnaces for all heat treat operations.

AT THE METAL SHOW we will welcome the opportunity of discussing your heat treating problems with you. Stop in and see us at **BOOTH No. D-118**

SURFACE COMBUSTION SC **TOLEDO, OHIO**

UPRIGHT ★ ★ ★

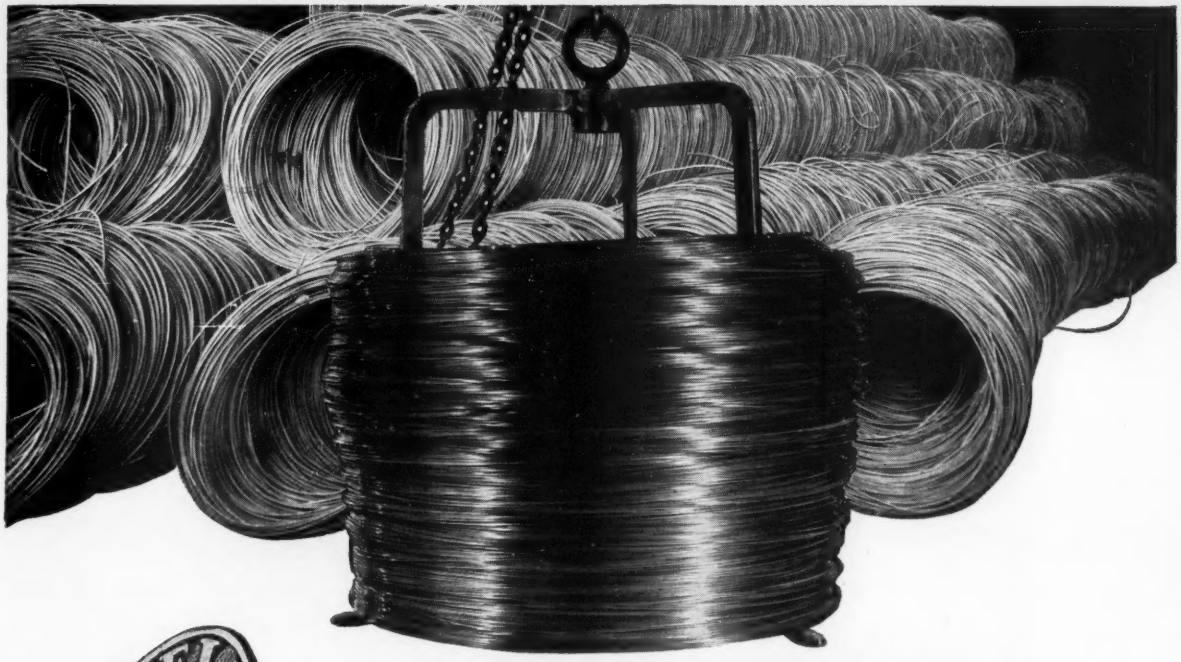
★ ★ ★ CONE

Wire Drawing Machines

FOUNDED WATERBURY FARREL 1851

These high speed machines are available in several sizes and can be had with either a coiling block or spooler. The spooler may be an attachment or a separate floor-type device, such as shown. This is the No. 4 machine with belt-type cradle spooler. It is driven by a direct-coupled motor (not shown), has 13 dies and capacity for drawing copper from ¼" maximum starting size down to a finishing size of from No. 10 to No. 18 B. & S. gage. The dies and the hardened steel drawing rolls are enclosed by a rolling steel curtain to confine the splash of the drawing lubricant.

WATERBURY-FARREL
FOUNDRY & MACHINE COMPANY
Waterbury, Connecticut, U. S. A.
SALES OFFICES CHICAGO CLEVELAND NEWARK, N. J.

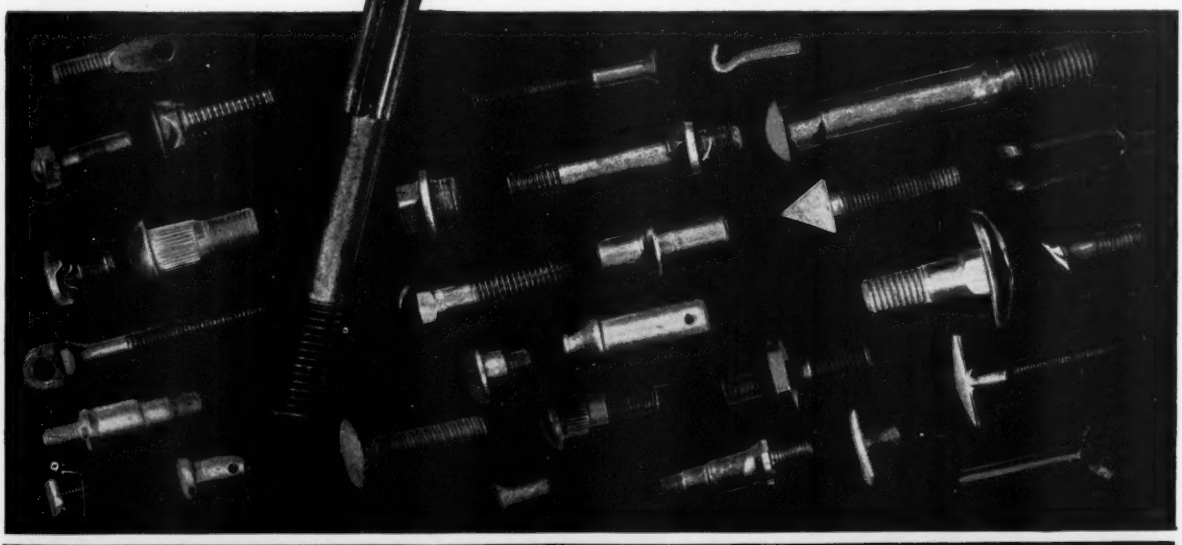


WHEELING puts emphasis on quality through every step of rod and wire manufacture . . . and quality is assured the fabricator. Wheeling facilities, and Wheeling control of these facilities, are thorough and complete.

WHEELING STEEL CORPORATION

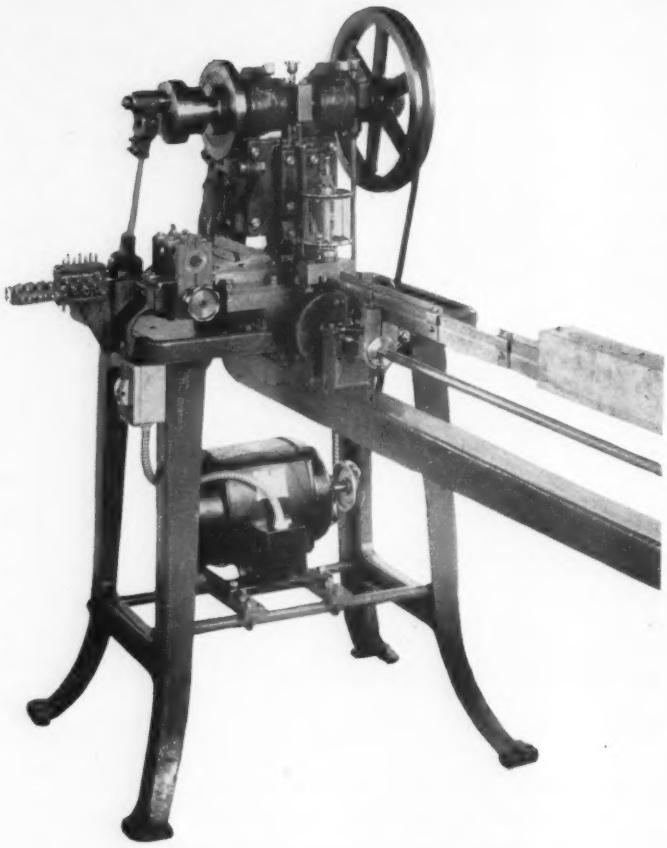
General Offices: Wheeling, West Virginia

District Sales Offices in principal cities of the United States



IT'S WHEELING STEEL

NILSON *Automatic* WI



STAPLE FORMING MACHINE NO. 1

This improved automatic staple machine takes the wire directly from the coil, straightens it, cuts off and forms staples at a high rate of speed. Adhesive is applied close to the forming tools and staples travel along the guideway through an electric heater for quick drying. The length of strip or number of staples to the finished piece is controlled by a counting and cut-off device. Length of feed is adjustable to accommodate different sizes of staples. A special attachment is required for chisel-point staples.

SPECIFICATIONS

Production	**375 Staples per Minute**
Approximate Net Weight	**600 lbs.**
Approximate Gross Weight	**725 lbs.**
Floor space (without wire reel)	**24″ x 72″**
Box Size for Export	**35″ x 36″ x 48″ high**

Nilson Automatic Staple Forming Machines have proven very practical and durable. Over a period of years they have built a fine record for trouble-free operation. Years of special machine design experience were in back of the first model, and it met quick success. Since then several improvements have been added when experiment and test proved them practical. Today these machines give you the best in low production cost equipment for the manufacture of staples.

THE A. H. NILSON M

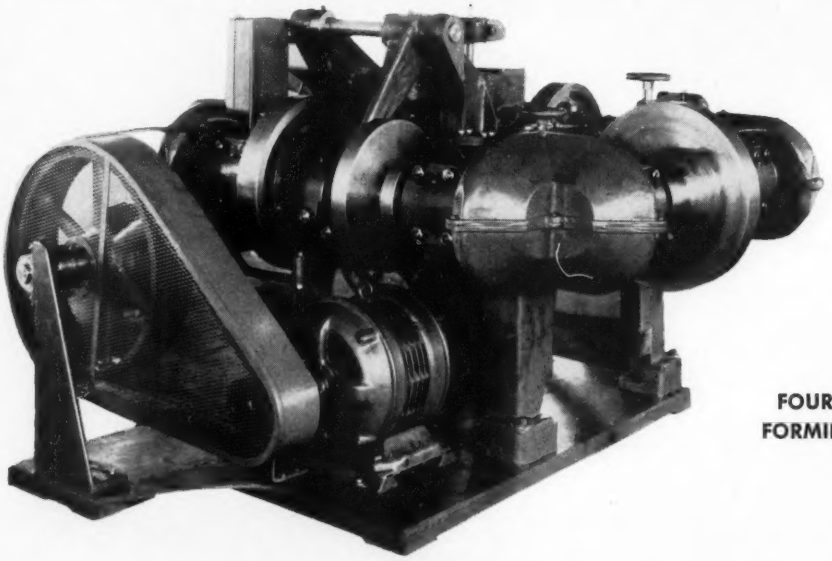
BRIDGEPORT

Builders of Special Machinery F

RE *Forming* MACHINERY

THE IMPROVED NILSON STANDARD FOUR-SLIDE WIRE FORMING MACHINERY

Nilson machines, made in a wide range of models, are the result of continuous improvement. Are efficient and practical, and designed for the rapid production of a great variety of products.



FOUR-SLIDE WIRE FORMING MACHINE

Wire forming operations of Nilson Four-Slide machines cover such products as paper clips, buckles, coat and hat hooks, cable rings, screw eyes, staples, cotter pins, package handles, egg-beater blades and numerous other articles of complex shapes. Wire may be round or flat and forming is done direct from coiled stock.

Special features include four forming slides of equal length, wire feed that is silent and frictionless, return motion of cut-off tool actuated by cam, special lubricating system for cam-roll studs, wire feed operated in straight line from crank disc and an improved wire-former bracket. Nilson machines take the wire directly from the coil, ***straighten,*** feed ***cut-off*** and ***form,*** in one continuous operation.

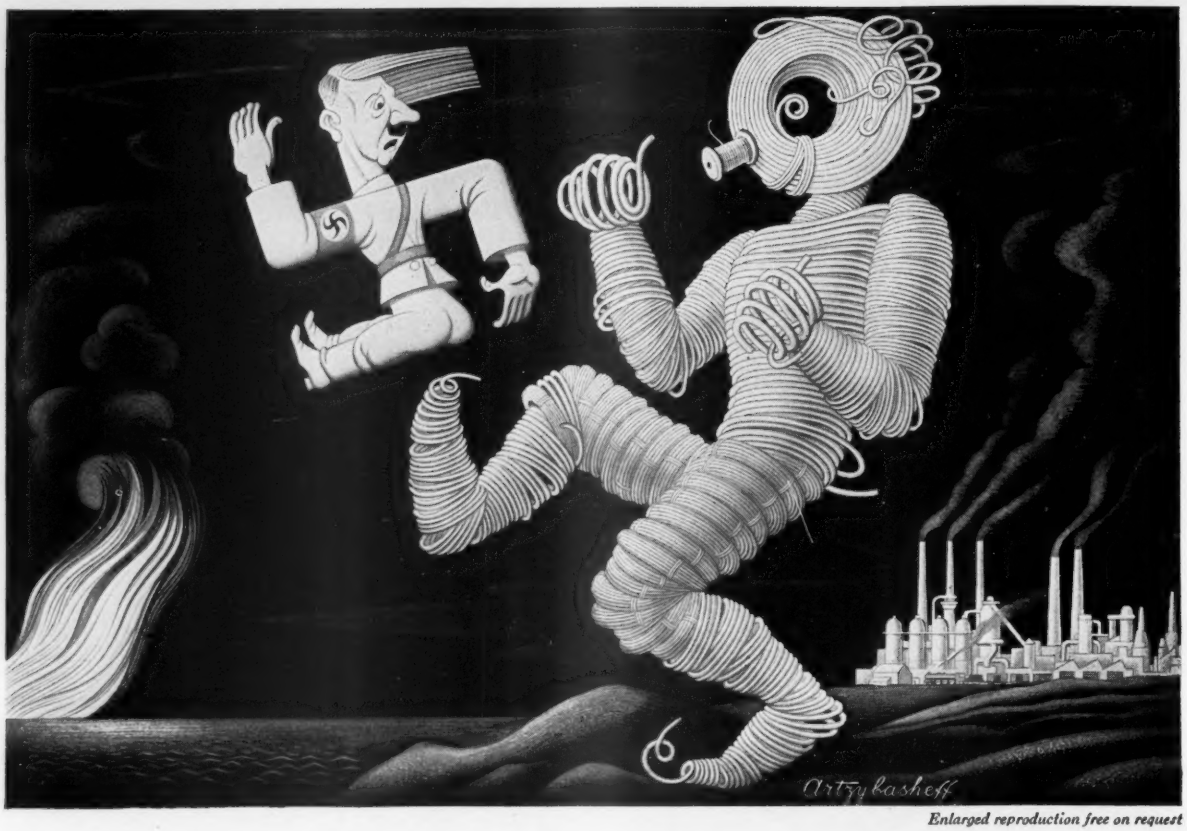
The wire feed is positive and simple, and does not depend on friction for its action. The gripping members are actuated by an independent motion which assures the same positive pull and tension on both long or short lengths of wire. The power operating the feed is applied in a straight line from the crank disc—an exclusive feature of the Nilson machine.

Accessories include a form lifter and press attachment, and a secondary cut-off can be furnished to any size machine without drilling extra holes.

MACHINE COMPANY

CONN., U. S. A.

For Over Fifty Years



Enlarged reproduction free on request

Wire with Kick in it

Wissco wire is putting temper, spring action, and strength into the attack.

It is fighting in everything from airplanes, to bombs, to torpedoes, to tanks, to uniforms, to warships . . . and then some.

In every foot of Wissco Wire is the fighting spirit of thousands of loyal production soldiers whose output for Victory is breaking all-time records. In every inch is the skill acquired in 121 years of research, discovery and pioneering—the things it took to make Wissco one of the world's leading wire producers.

If you have a war need for wire, put it up to experts. Wickwire Spencer Steel Company, 500 Fifth Avenue, New York; Buffalo, Chicago, Detroit, Philadelphia, San Francisco, Worcester.

EVERYTHING IN WIRE. High and Low Carbon Wire—Wire for Springs, for Wire Rope, for use in scores of industries, in a variety of sizes, tempers, grades and finishes.

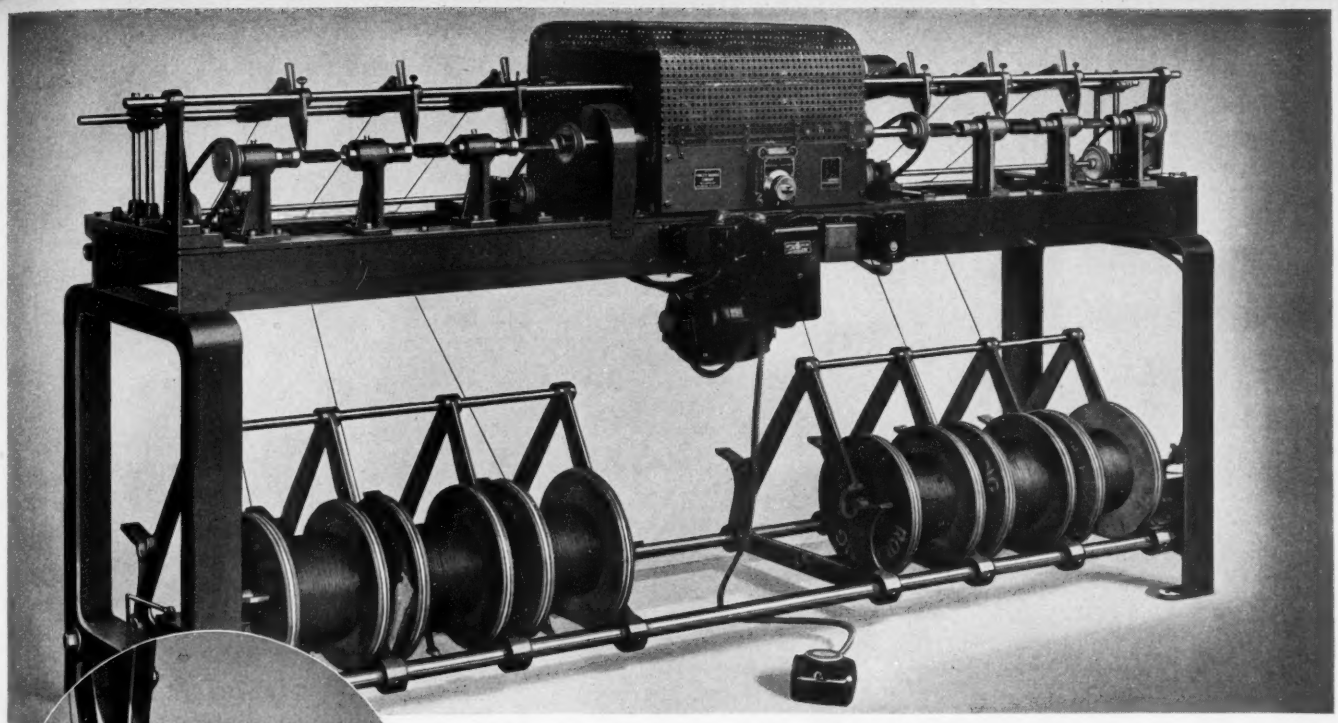
CURIOSITY INC. Wissco research has produced many basic improvements in wire metallurgy, and in wire uniformity and quality. Every step from ore pile to blast furnace, to open hearth, to finished wire is done right in our own mills.

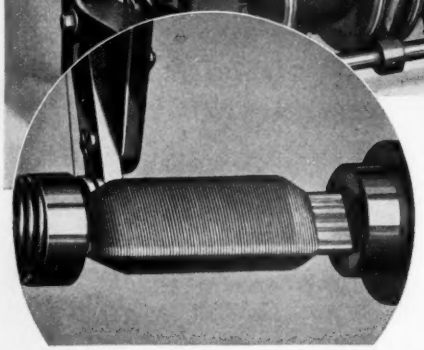
SEND YOUR WIRE QUESTIONS TO WICKWIRE SPENCER

WISSCO WIRE

BY WICKWIRE SPENCER

WISSCO PRODUCTS





Above: **FIDELITY** Spooling Machine with new hydraulic control to wind wire on flat or square sticks from brake-controlled reels.

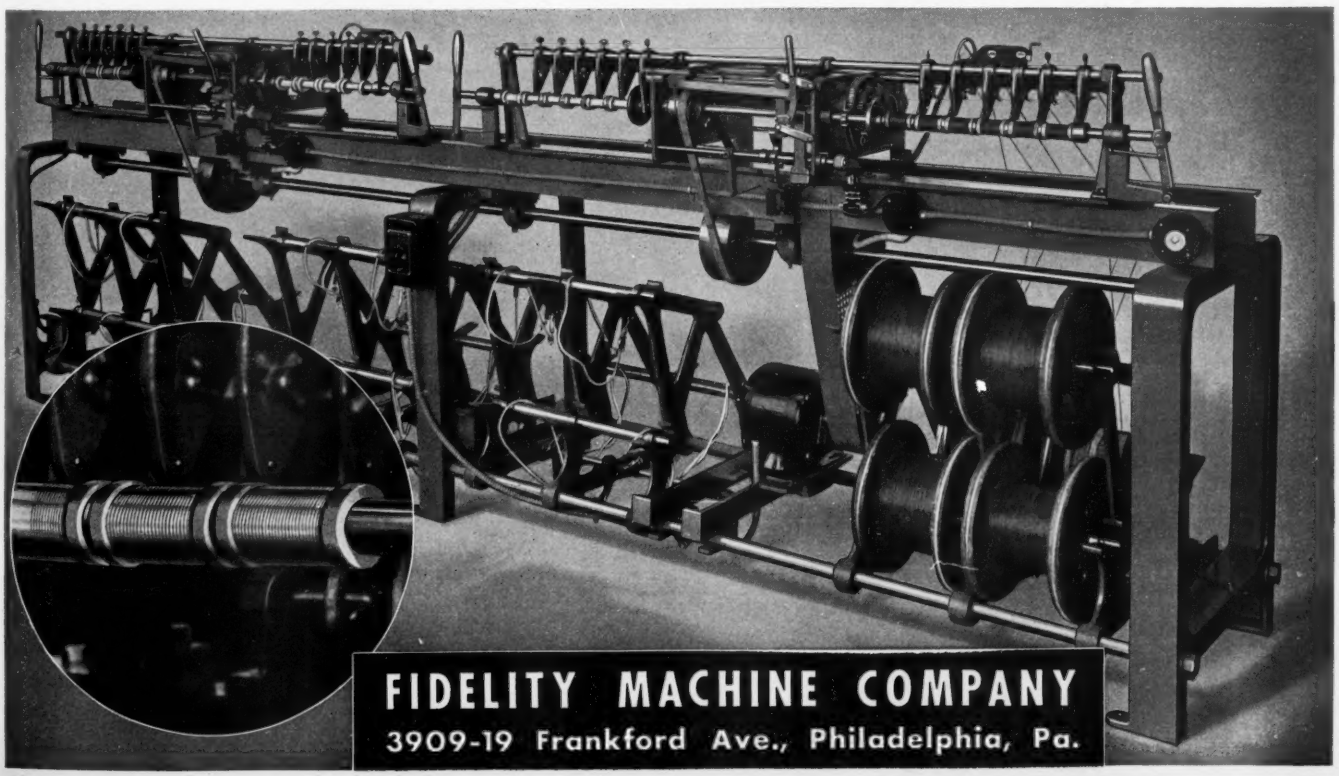
Below: **FIDELITY** Screw Traverse Machine winds wire on conventional type wooden or metallic spools.

FIDELITY Wire Spooling Machines

---from Reels or Coils
---to Sticks or Spools

Precision winding at high speed, with unvarying weight and even lay of wire on spool or stick—these are outstanding advantages of **FIDELITY** Wire Spooling Machines. They are quickly adjusted to required length, thickness or spacing—simple to operate, minimum labor attention and low horsepower.

Write for illustrated folder describing four types of standard machines and operating specifications.



FIDELITY MACHINE COMPANY

3909-19 Frankford Ave., Philadelphia, Pa.

WIRE for Practically All Purposes and Requirements

IRON—STEEL—ALLOY—LOW CARBON—HIGH CARBON

SHAPES

Square - Keystone - Flat
Round - Half Round - Special
Shapes - Straightened
and Cut

STOCK

High Carbon - Low Carbon
Alloy

Tempered and Untempered

FINISHES

Liquor Finish - Bright
Galvanized - Coppered
Enameled All Colors
Annealed - Tinned
Oil Tempered

FOR

Belt Hooks
Binding - Bonnets
Bookbinders
Brooms - Brushes
Clips - Cotter Pins
Crimping
Cushion Springs
Florist - Glass Wire
Grape Tying
Hair Pins - Heddles
Hook and Eyes
Link Fabrics
Lock Washers
Mattresses
Picture Cord - Pins
Rock Fasteners
Special Springs
Ropes - Stapling
Stone Wire
Tags - Weaving

WELDING WIRE RODS AND COILS—Sizes, ½" to No. 40 WM Gauge (.007)—All Finishes
• FLY SCREEN WIRE CLOTH • GALVANIZED HARDWARE CLOTH •

FLAT COLD ROLLED STRIP STEEL

Highest Quality and Service Guaranteed

Established 1905

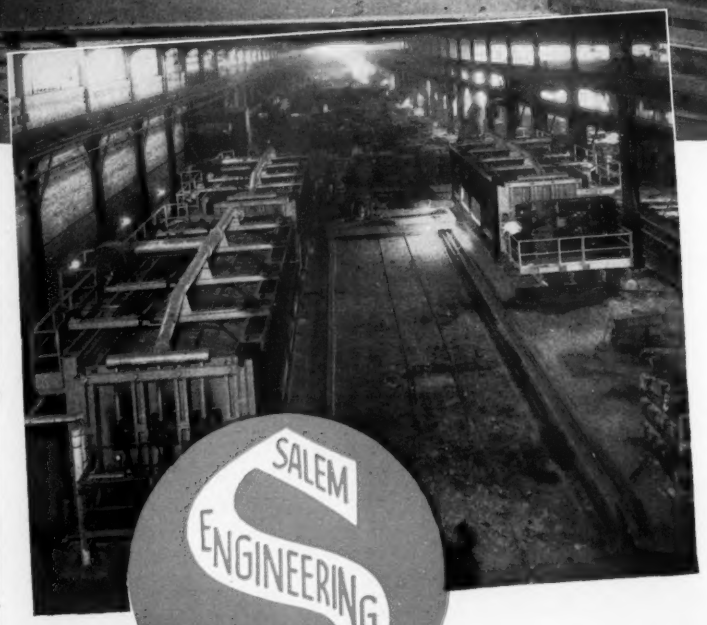
The Seneca Wire & Mfg. Company

Fostoria, Ohio

Representatives and Warehouses in principal cities.

PERFORMANCE EXTRAS

in Salem War Production Furnaces



SALEM ENGINEERING COMPANY

● ● ● ● This type Salem batch furnace heats ingots, billets, and slabs. It heats plain, high carbon and alloy steels equally well since the heating cycle, atmosphere, pressure, and time elements are under strict control. Scientific discharge of waste gases assures uniform heating on low firing rates. Production capacity of alloy steel exceeds 6 tons an hour at 2250° F. The chambers (9' x 16') are double and each has two doors. Only two men synchronize loading, heating, and unloading operations, providing EXTRA production with low operating costs. Salem offers all types of heat treating equipment with special performance features. Write today.

SALEM ENGINEERING CO. • SALEM, OHIO

"GET IN YOUR SCRAP—

WE'LL PRODUCE THE FIGHTING STEELS!"

. . . this headline statement is a challenge that comes to you from the thousands of steel workers throughout America. Like the men in your own plant, these steel men are doing their fighting by producing war materials in greater volume than ever before, and they are doing it largely with existing furnaces and machines. Men in steel are determined to hold *their* production records, and even to better them, so that your workers may have the steel they need.

To do this requires scrap and more scrap, and the steel workers look to you to help yourself by helping them get the scrap.

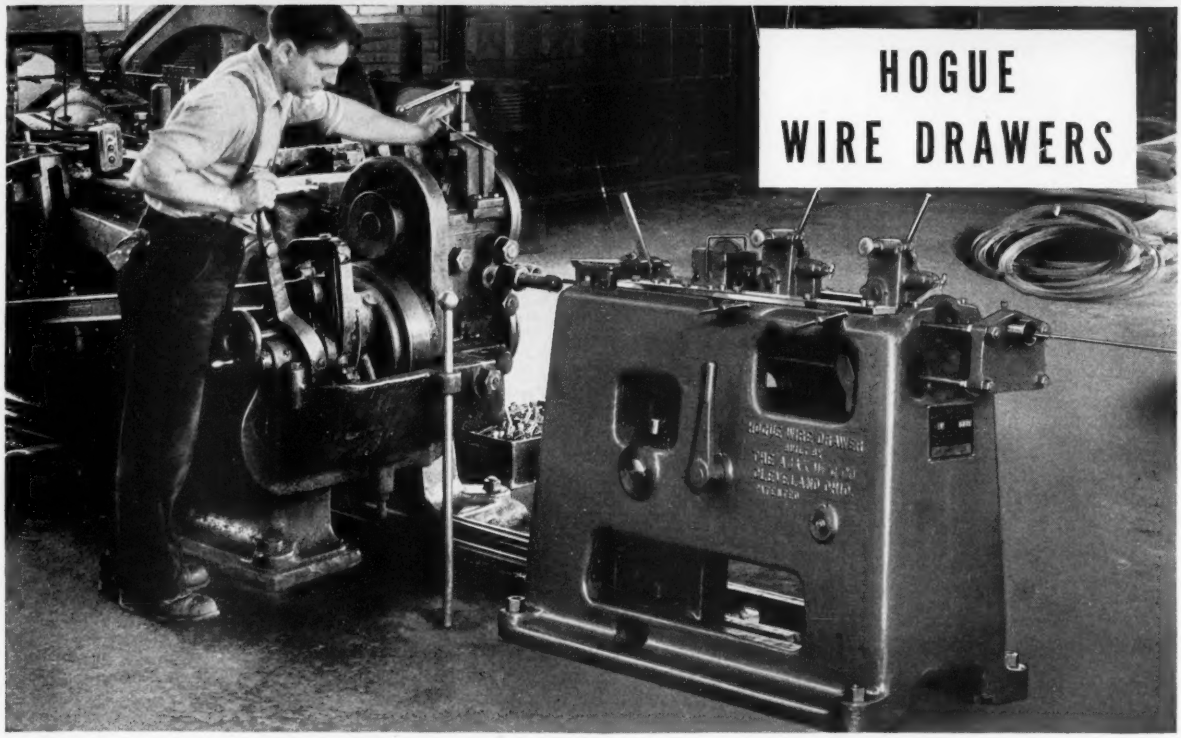
JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

PARTNER TO INDUSTRY IN WAR PRODUCTION

J&L STEEL

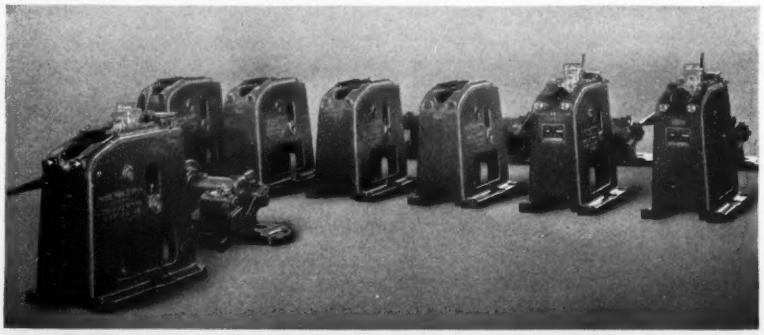
AJAX



REDUCE COLD HEADING DIE COSTS

Increase header die life—Substantially longer heading die life, especially for close specification products, and increased operating efficiency result from straight, accurate, clean and freshly-drawn wire free from age hardening and gritty accumulation.

Increase Profits—Because of savings in heading die costs and lower drawing costs, even in plants which already have their own cold drawing department, profits are substantially increased by the use of Ajax Hogue Wire Drawers.



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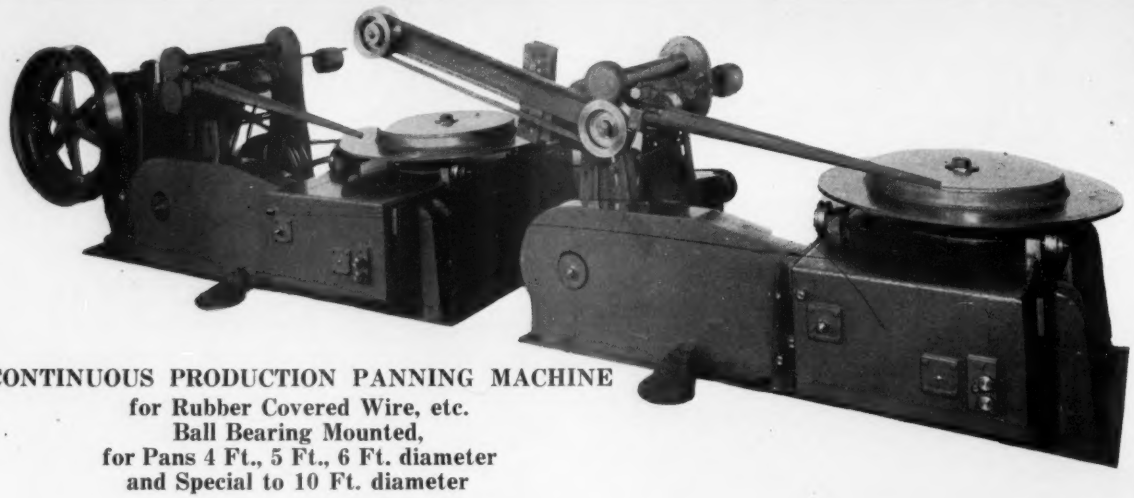
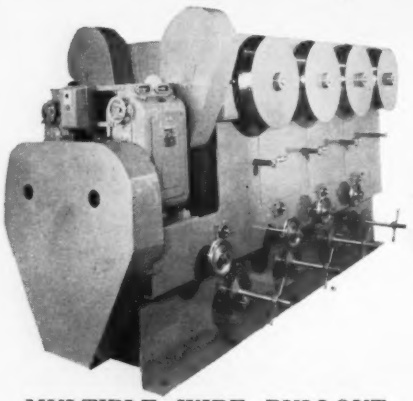
This repeat order for seven Ajax Hogue Wire Drawers, from a company already operating its own cold drawing department, was the result of the profits from a trial installation.

Write for Bulletin No. 111

THE AJAX MANUFACTURING COMPANY
EUCLID BRANCH P. O., CLEVELAND
621 MARQUETTE BUILDING
CHICAGO, ILL.

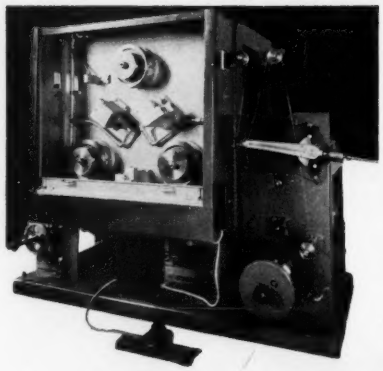


CONTINUOUS PRODUCTION PANNING MACHINE
for Rubber Covered Wire, etc.
Ball Bearing Mounted,
for Pans 4 Ft., 5 Ft., 6 Ft. diameter
and Special to 10 Ft. diameter

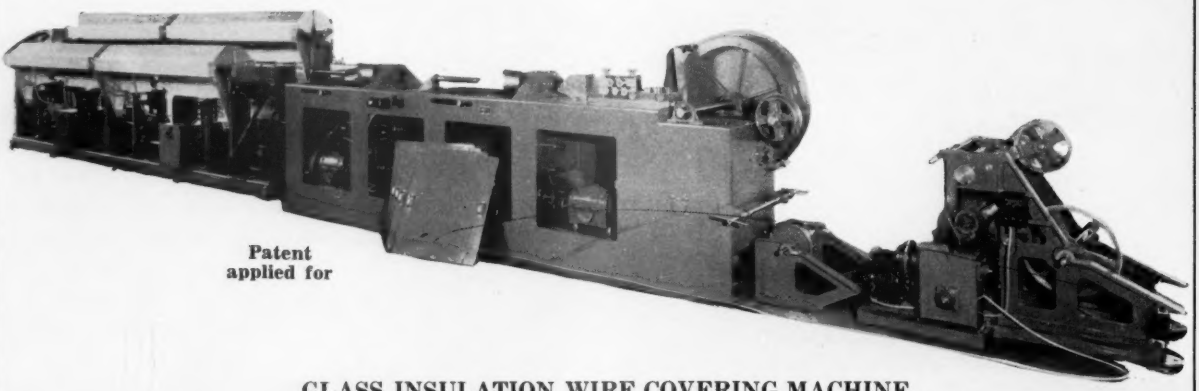


MULTIPLE WIRE PULLOUT
with Slip Friction Takeups and
Speed Variators for Tinning,
Annealing and Saturating
Processes, etc.
Ball Bearing Mounted.

EST. 1855 INC. 1915
"American"
INSULATING
MACHINERY
COMPANY
517 West Huntingdon St.
PHILADELPHIA PENNSYLVANIA U.S.A.



HIGH SPEED WIRE DRAWING MACHINE
for Intermediate and Fine Wire

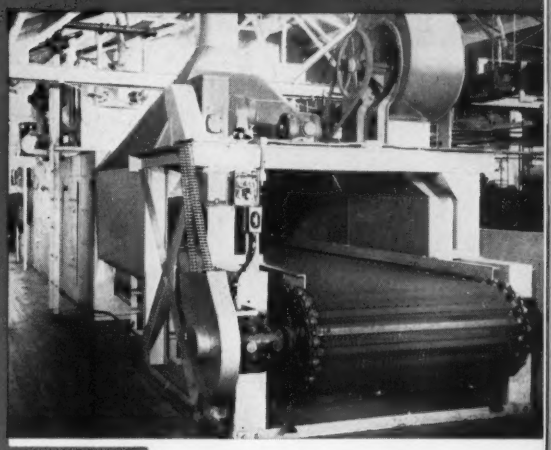


Patent
applied for

GLASS INSULATION WIRE COVERING MACHINE
with Let-off and Take-up Reel Stands,
Ball Bearing Mounted and
Variable Speed Motor Drive,
Baking Ovens with Two Coat Varnish Applicators,
and Individual Automatic Temperature Controllers.

. . . OVENS . . . FURNACES . .

CARL-MAYER Speed BOOSTS WAR PRODUCTION



SHELL FURNACES

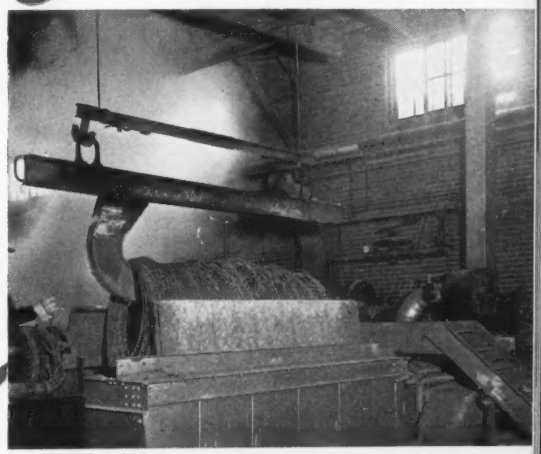
This Carl-Mayer Recirculating Air Heater Furnace is built for stress relieving shot and shells from 20 to 105 mm. Carl-Mayer Furnaces are used by leading plants on various types of war production because of their remarkably fast heating cycle, uniformity—plus or minus 2½°F., and fuel economy.

THE PRESENT CRISIS DEMANDS THE BEST!

Repeat orders from concerns of national prominence is proof of the outstanding character of Carl-Mayer's Creative Engineering, especially when they are obtained in face of wide furnace and oven competition. Carl-Mayer repeat orders average more than THREE per customer.

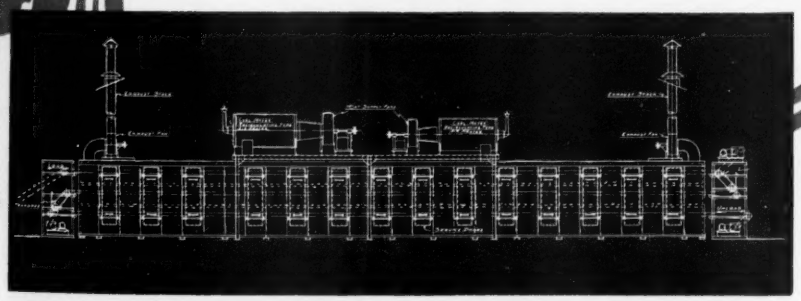
OVER 20 YEARS' EXPERIENCE!

Wire for a Carl-Mayer Engineer to call, or write for Bulletin 241.



HI-SPEED TRADE MARK ROD BAKERS

The fastest rod bakers built! Savings up to 50% in time and fuel. Patented Blow-off feature removes moisture without bumping or agitating the coils. Patented and patents pending.
Let us show you Carl-Mayer Hi-Speed Rod bakers in operation. You'll be amazed and convinced that our claims are conservative.



WELDING ROD OVENS

Carl-Mayer Welding Rod Oven dries coated welding rod speedily, efficiently, economically. Uses the "Mayer" Recirculating Gas Fired Air Heater Principle and Rod Transfer Systems (patents pending). The policy of users and the war prohibit photographs of installations.

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Atlas Steel Co.
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WHY MOST WIRE MILLS USE MORRISON FLASH BAKERS

More Morrison Flash Bakers and Rod Bakers are in use in the wire industry than the sum of all other makes combined. This is the result of specialization on wire mill problems. Many more processes are facilitated if rod baking is performed properly; and through years of experience, invaluable knowledge has been gained and applied to Morrison equipment. With un-precedented demands now falling upon wire mills, be sure that your new baking equipment is built by Morrison.

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FLASH BAKER

Allied Products Corp.
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5 TRUCK ROD BAKER

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Joliet, Illinois
4 FLASH BAKERS

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American Steel & Wire Co.
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4 FLASH BAKERS

Angell Nail & Chaplet Co.
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2 TRUCK ROD BAKER

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42 TRUCK ROD BAKER

Bethlehem Steel Co.
Johnstown, Pennsylvania
6 FLASH BAKERS

Bethlehem Steel Co.
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Bethlehem Steel Co.
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FLASH BAKER

Crucible Steel Co. of America
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FLASH BAKER

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Sanderson Works, Syracuse, N. Y.
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Harrison, New Jersey
4 TRUCK ROD BAKER

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6 TRUCK ROD BAKER

India Steel & Wire Co.
Tatanagar, India
16 TRUCK ROD BAKER

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FLASH BAKER

Laclede Steel Co.
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FLASH BAKER

National Screw & Mfg. Co.
Cleveland, Ohio
12 TRUCK ROD BAKER

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New York Wire Cloth Co.
York, Pennsylvania
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Monessen, Pennsylvania
FLASH BAKER

Reid-Avery Co.
Dundalk, Baltimore, Maryland
FLASH BAKER

John Rigby Sons, Ltd.
England
8 TRUCK ROD BAKER

Russell, Burdsall & Ward B. & N. Co.
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FLASH BAKER

Seneca Wire & Mfg. Co.
Fostoria, Ohio
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Seneca Wire & Mfg. Co.
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FLASH BAKER

Sheffield Steel Corp. of Texas
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FLASH BAKER

Steel Co. of Canada, Ltd.
Notre Dame Works, Montreal
FLASH BAKER

Steel Co. of Canada, Ltd.
Canada Works, Hamilton
2 FLASH BAKERS

Steel Co. of Canada, Ltd.
Dominion Works, Montreal
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FLASH BAKER

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Youngstown Sheet & Tube Co.
Youngstown, Ohio.
FLASH BAKER

The Flash Baker is an exclusive development of the Morrison Engineering Corporation, covered by U. S. Patents 1,999,513 and 2,156,303; British Patent 515, 496; Canadian Patent 393,837. Other patents pending.

MORRISON ENGINEERING CORP

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Lime
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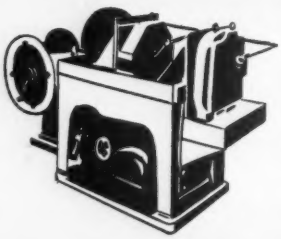
"LET YOUR WAGES WAGE WAR ON THE AXIS"

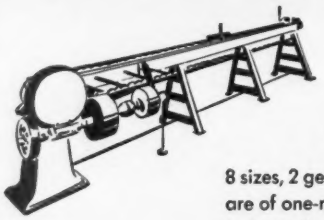
AT METAL SHOW . . . BOOTH A-421

STANDARD MACHINERY CO. REPRESENTATIVES WILL BE ON HAND TO DISCUSS THE APPLICATION OF ANY OF THIS EQUIPMENT WITH YOU . . .



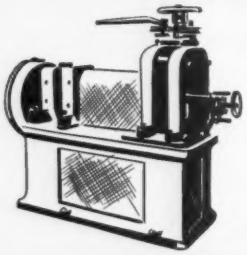
TURKS HEADS

Adjustable draw plates —accepted by wire trade as accurate, efficient means of producing rectangular and special shapes. With friction or power driven rolls. Catalog TH.



DRAW BENCHES

8 sizes, 2 general types. Machines are of one-man type with all controls at die end. Catalog DB.



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STRIP AND WIRE

Roller bearing and plain bearing mills; many regular sizes or made to suit user's specific needs. Write fully.

SWAGING MACHINES

For reducing diameter of tubular and solid bar stock into cylindrical, conical, or "necked" shapes. Capacities from ½" tube, ¼" solid to 6" tube or 3¾" solid. Catalog SM.

AND ALSO THE *NEW* STANDARD FLUID DRIVE
SUITABLE FOR MANY USES, INCLUDING:

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If not at the Metal Show, write for information mentioning equipment in which you are interested, address —

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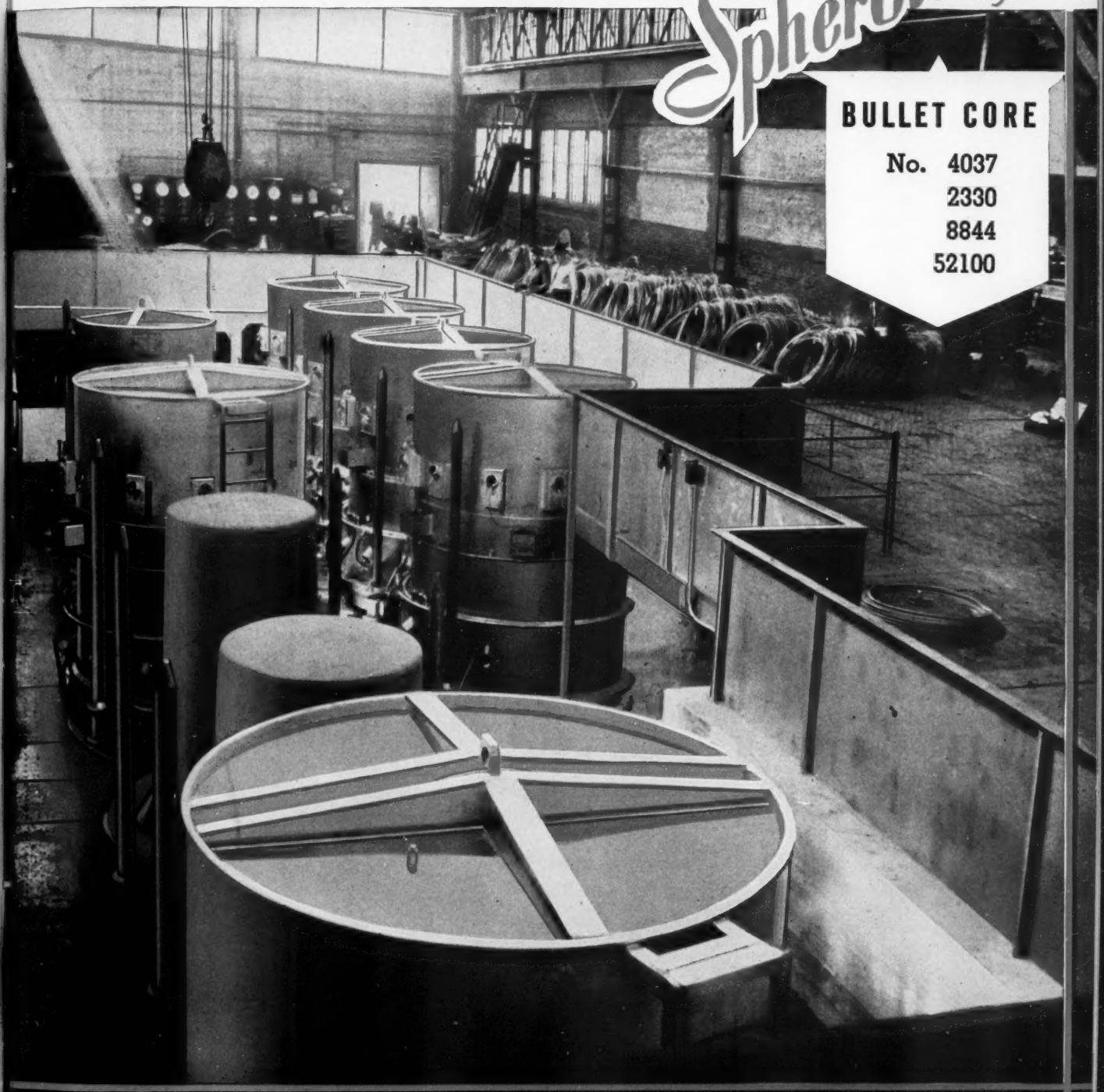
PROVIDENCE . . . . RHODE ISLAND

Furnaces for ALLOY ROD COIL Spheroidizing



BULLET CORE

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Lee Wilson ENGINEERING Co.

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Telephone AC-4670

The Wilson Annealing Unit is covered by Patents Nos. 1952402, 2068477, 2074356, 2081813, and other patents pending

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for grinding carbide tipped Tools

THERE are three types of Norton wheels used for grinding the cemented carbides. Each has its field. For example: *metal bonded diamond wheels* for the off-hand grinding of single point tools; *resinoid bonded diamond wheels* for sharpening multi-blade tools such as milling cutters; *Crystolon wheels* for many roughing operations.

Norton abrasive engineers are familiar with all three types and their proper application. To obtain their help contact direct or through your Norton distributor.

You'll also find much helpful information in the Norton booklet illustrated below. There's a complete chapter on the selection and use of each type of wheel. Just ask for Form 167-WP.

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Worcester, Mass.

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NORTON ABRASIVES

Uniformity

Every coil of wire heat treated by the Trauwood Process is absolutely uniform from end to end, in structure and physical properties.

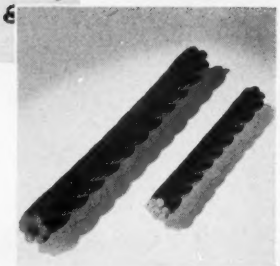
Users report millions of pounds of wire heat treated by the Trauwood Process without a single rejection.

The Trauwood Electric Direct Resistance method of patenting, tempering and annealing, vastly speeds up and improves these processes, thus rendering a most valuable contribution to war production. It is being used for heat treating wire in barrage balloon, submarine, mine, and aircraft cables, in signal corps lines and in many other applications which demand wire having the highest possible physical and fatigue properties.

OUTSTANDING ADVANTAGES

Much faster production . . . . No decarburization or scale . . . . Fully automatic — human equation eliminated . . . . Easy to operate . . . . Control of heating and cooling cycles extremely accurate . . . . Low cost operation . . . . High thermal efficiency . . . . Uniform physical and fatigue properties.

Our Engineers will be glad to cooperate with you.



Trauwood

The Wire Association Convention meets in Cleveland Oct. 12 - 16

THE TRAUWOOD PROCESS
of Electric Patenting of Wire will be demonstrated the afternoon of October 15th

THE TRAUWOOD ENGINEERING COMPANY

1740 E. 23rd Street **Cleveland, Ohio**

PLAN TO ADVERTISE

DURING 1943 IN

WIRE AND WIRE PRODUCTS

WIRE and WIRE PRODUCTS will carry your advertising story into every wire mill in the country — and to most mills in the far corners of the earth. And will reach in addition every important wire products fabricator — those who buy wire on a tonnage basis.

+ + + + + + + + +

These mills and factories are a great market and are important cogs in America's war work. Without wire, armies cannot move, civilians cannot live, so closely is the use of wire knit into every activity and product — land, sea and air.

+ + + + + + + + +

And while you are busy today — asked to do more than physically possible — the wise man will hold his sales organization together, maintain his customer contacts, and advertise to hold his customers' good-will against the day when he will need every ounce of it. The great majority of those comprising the wire industry — those who make wire, who make wire products, and those who make machinery and supplies for it, are wise men.

+ + + + + + + + +

So if you have a new aid to production, a better metal, a more efficient machine, a speedier way to process metals, plan to sell the vital and immense metals industry, of which wire is an important integral part, through WIRE and WIRE PRODUCTS.

• • •

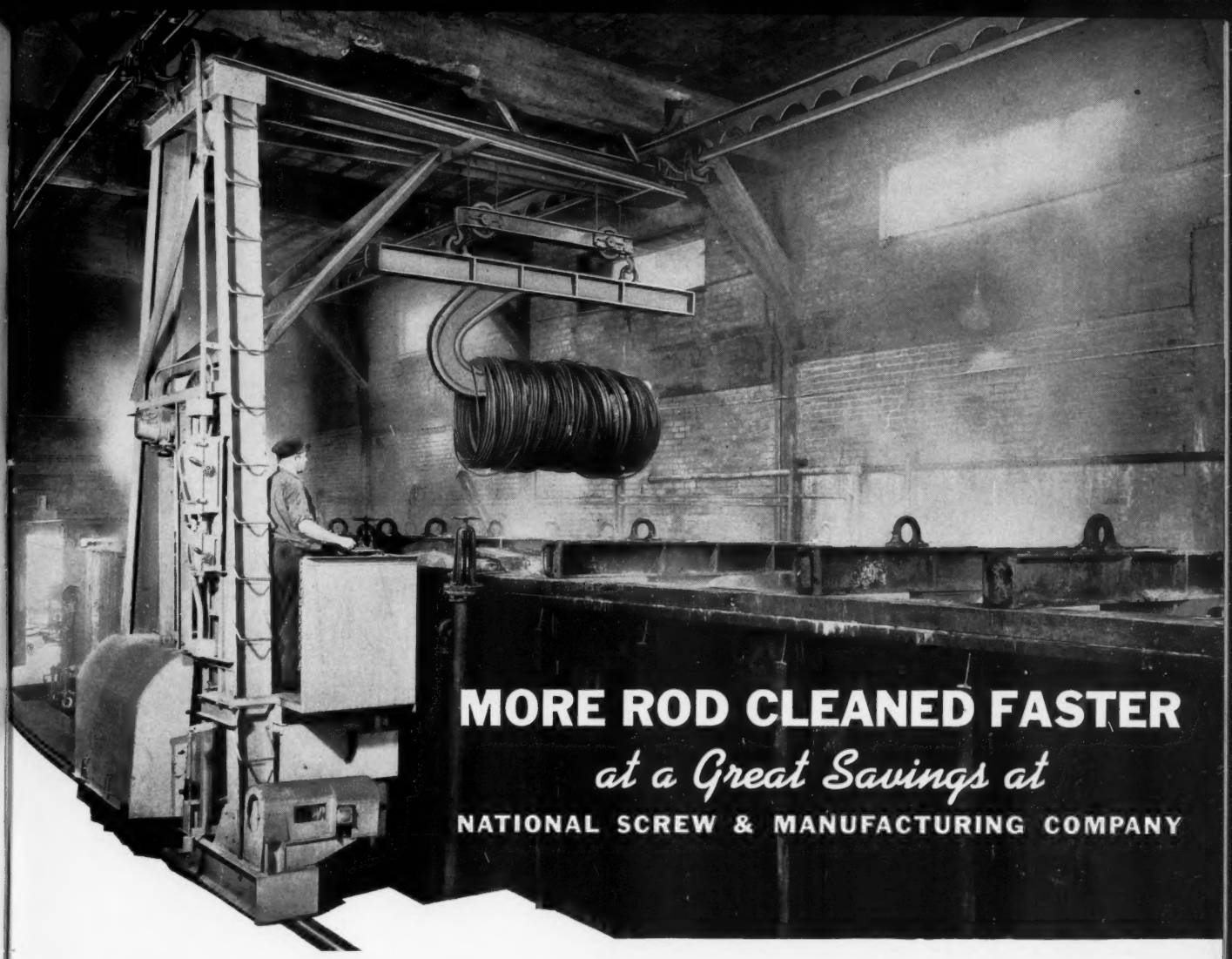
CULTIVATE THE WIRE and WIRE PRODUCTS INDUSTRY

through advertising in

WIRE and WIRE PRODUCTS

Don't put it off—write today for details.
Better yet, just send your order and copy.

WIRE AND WIRE PRODUCTS
300 MAIN STREET
STAMFORD, CONN.



MORE ROD CLEANED FASTER

at a Great Savings at

NATIONAL SCREW & MANUFACTURING COMPANY

In the summer of 1941 the National Screw & Manufacturing Co., Cleveland, installed a Cleveland Tramrail Cleaning House Gantry Crane in the same building that long had been used as their cleaning house. The equipment was erected over a week-end and ready Monday morning without interrupting the production schedule.

The installation has proven highly successful. More rod is cleaned faster with approximately two-thirds of the man-hours of labor formerly required. Eight 300-pound, 48-inch O. D., coils are handled as a unit load through the cleaning line. The layout consists of two four-pin rubber-lined acid tubs, a combination high pressure water spray and rinse tank, a lime tub and a flash baker, all set on the floor for easy maintenance. All operations through the cleaning and baking cycle are handled by the operator of the gantry crane.

A straight cleaning house layout with a Cleveland Tramrail gantry crane requires less space, *enforces* cleanliness, orderliness, and better working conditions, all at a lower cost per ton of rod cleaned.

BOOKLET No. 2008 . . Packed with valuable information. Profusely illustrated. Write for free copy on your company letterhead.

GET THIS BOOK!

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
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MANUFACTURERS OF • CLEVELAND CRANES • CLEVELAND TRAMRAIL • STEELWELD BENDING PRESSES

CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

OUR
FULL
POWER
AMERICAN
WIRE WORKERS
AND MANUFACTURERS
throw
it !!
SPENCER WIRE
CO.
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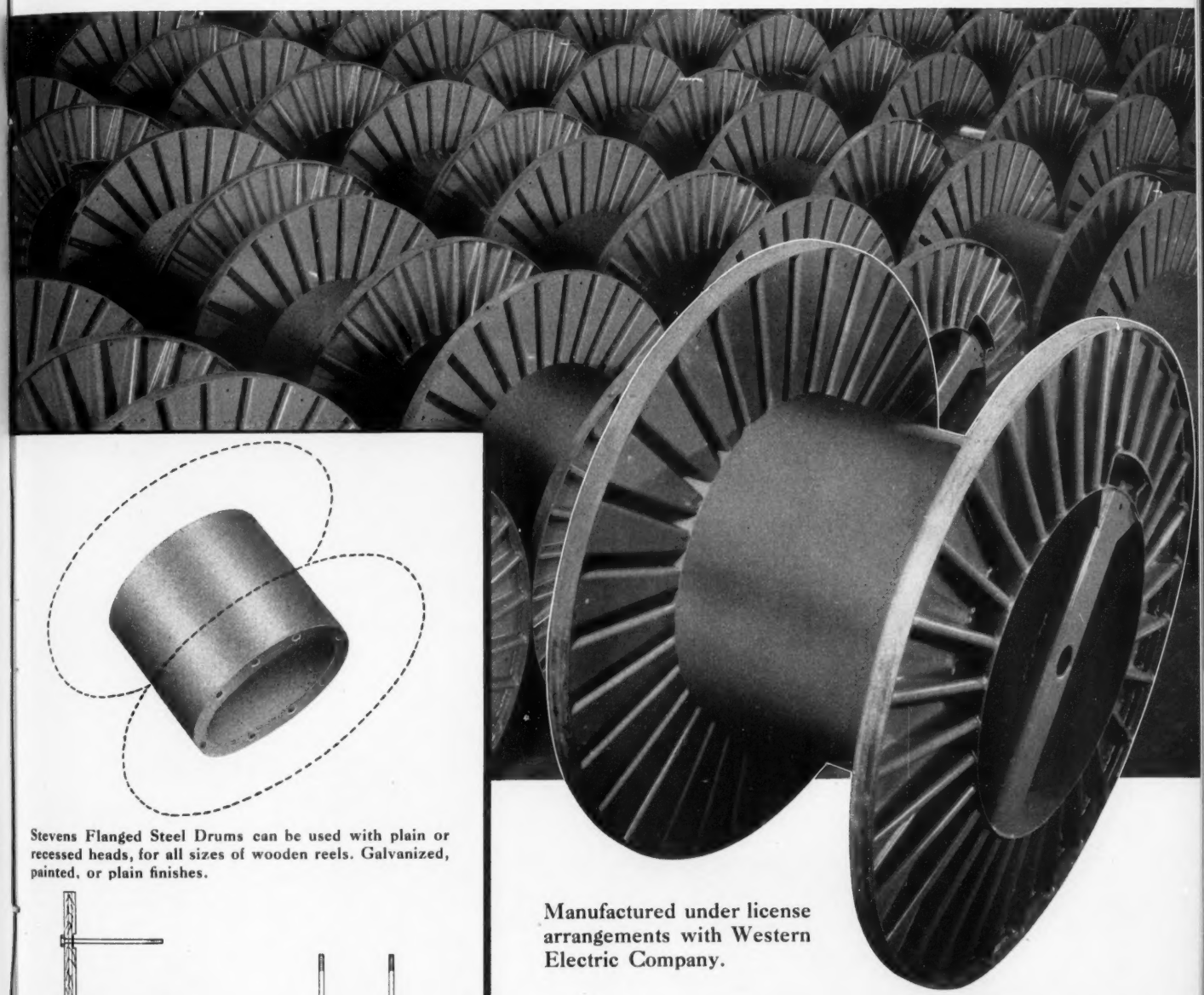
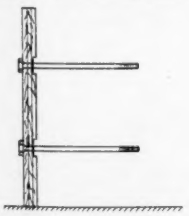
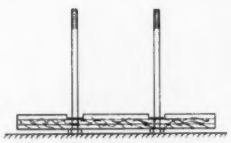
STEVENS
LOW TARE STEEL REELS



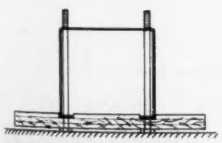
Stevens Flanged Steel Drums can be used with plain or recessed heads, for all sizes of wooden reels. Galvanized, painted, or plain finishes.



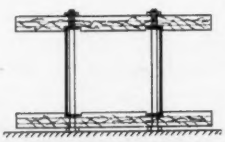
To assemble reels—FIRST OPERATION. Set first wooden head on edge and insert thru bolts.



SECOND OPERATION. Then lay wooden head flat on floor.



THIRD OPERATION. Put bolts thru flanges of drum.



FOURTH OPERATION. Set second wooden head on drum and screw nuts on bolts. This completes assembly.

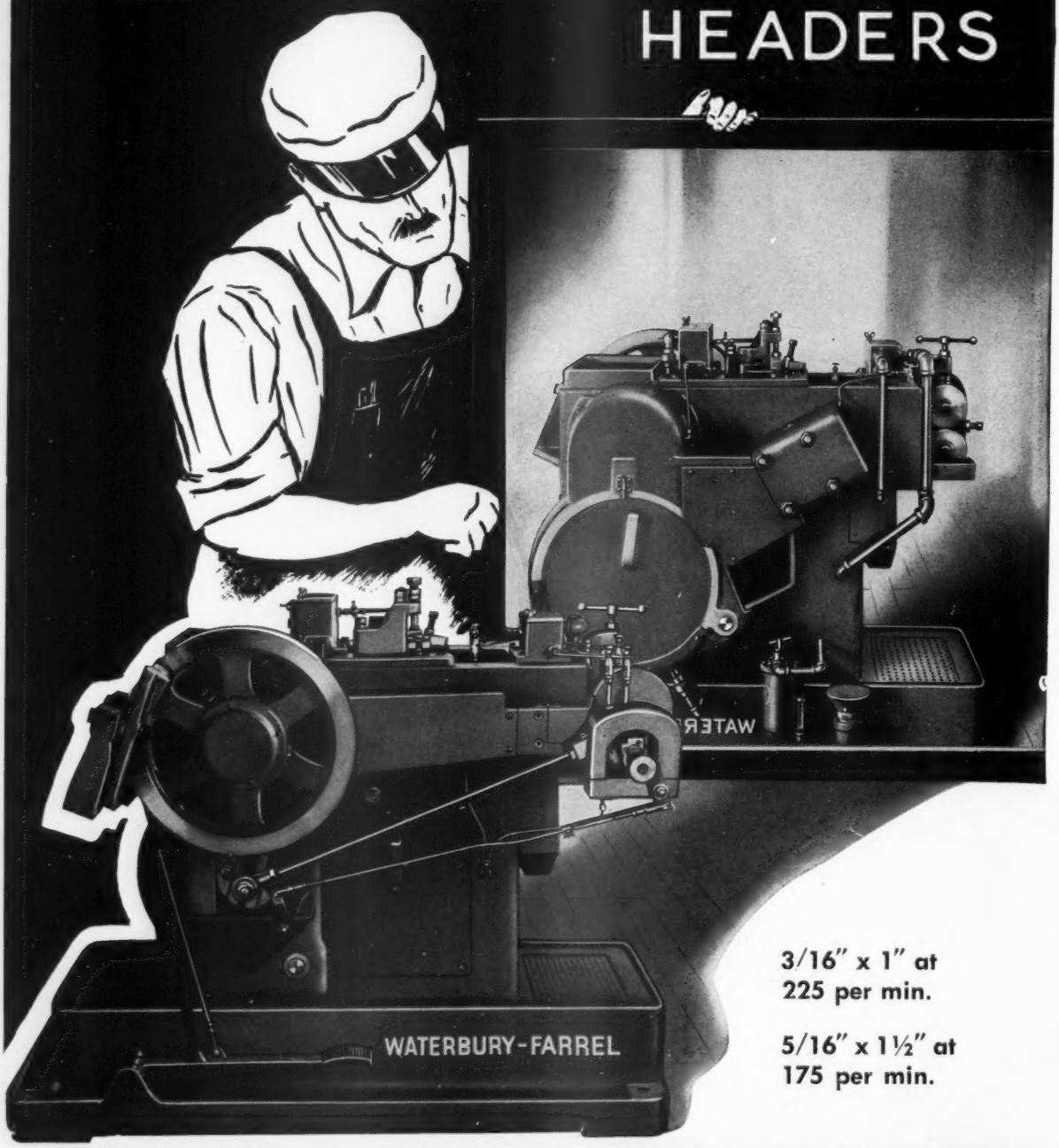
Manufactured under license arrangements with Western Electric Company.

STEVENS has engineered progressive and worthwhile advantages into reels and flanged steel drums. Both of these Stevens products promote lower maintenance costs as well as important operating economies.

THE STEVENS METAL PRODUCTS CO.

N I L E S , O H I O

WATERBURY FARREL • HI-PRO HEADERS



3/16" x 1" at
225 per min.

5/16" x 1½" at
175 per min.

These modern high-speed S.D.D.S.* headers fit right into the NATIONAL DEFENSE PROGRAM—they're just the thing for large quantity production; in fact they lead the field!

*Solid Die Double Stroke

WATERBURY FARREL FOUNDRY AND MACHINE COMPANY

WATERBURY, CONNECTICUT

CLEVELAND CHICAGO NEWARK, N. J.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 17 OCTOBER, 1942 No. 10

Designated as

Official Publication By The Wire Association

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Publication Office: Washington, N. J.
Executive Office: Stamford Trust Co. Bldg., 300 Main St., Stamford, Conn.

Annual Subscription, U. S. $5.00, Canada $5.00

50 Cents a Copy in U. S. Issued Monthly Foreign, $7.50

October Convention Issue $1.00 a Copy
January Convention Discussions Issue $1.00 a Copy

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WIRE & WIRE PRODUCTS, Vol. 17, No. 10, October, 1942, Executive Office, 300 Main St., Stamford, Conn. Published by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secretary and Treasurer. Publication office, 13 West Church Street, Washington, N. J. Subscription price: U. S., $5.00; Canada, $5.00 per year, 50 cents per copy; Foreign, $7.50 per year. Entered as second class mail at the Post Office, Washington, N. J., under Act of March, 1879.

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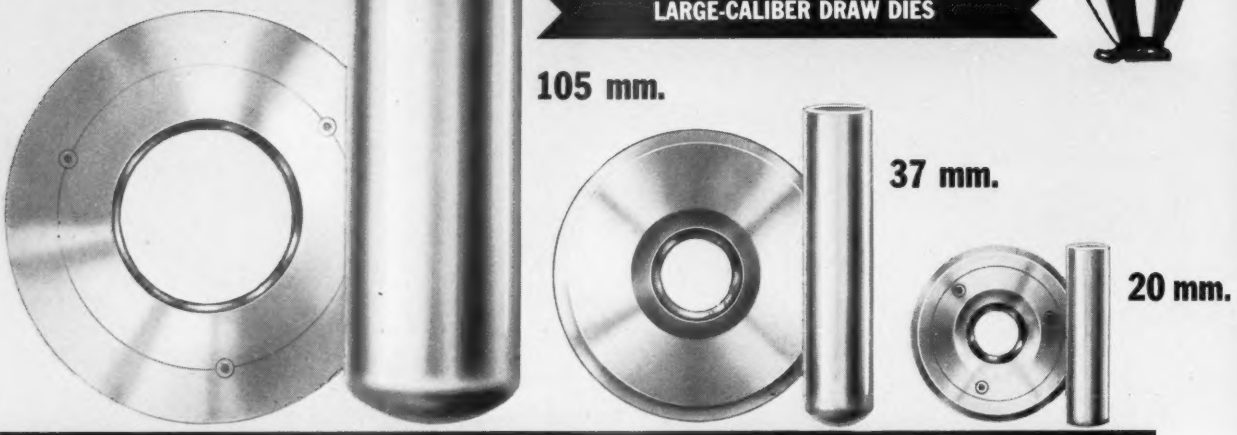

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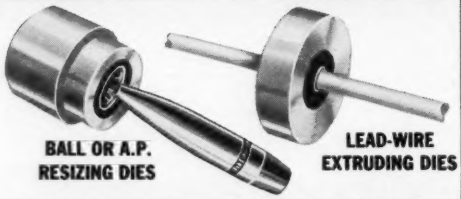
CARTRIDGE-CASE AND BULLET-JACKET DRAW DIES

MISCELLANEOUS



WHO?—in World War II—pioneered the making of cartridge cases, bullet jackets, primer cups, booster cups, bomb fuses—and ALL large and small ammunition—**America's efficient way?** The answer: FIRTHALOY! And now that the arms-makers have turned from brass to steel cartridge cases, FIRTHALOY is still in the fore-front. FIRTHALOY'S background of peace-time experience with deep drawing—FIRTHALOY'S intensive research in war applications—**both** are reasons for FIRTHALOY'S **dominance** in the field of ammunition dies today . . . cal. 22 to 105 mm. These dies can be furnished rough cored, rough drilled, or finished.

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 17 OCTOBER, 1942 No. 10

Scheduling and Planning the Wire Mill for War Production

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Every Wire Mill has more or less the same basic problem in production control and there is no fixed or absolute way of routing materials through. Technical problems vary considerably from plant to plant. Therefore, part of the system of production control, as outlined, will be inapplicable in some wire mills, will require adaptation in others and be of some small help to those Wire Mills which have already undertaken production control programs.

The system of production scheduling and planning, as presented herewith is a plan which has proved helpful and has worked satisfactorily in a combination production and jobbing wire mill, and is presented for whatever assistance it may be to the members of the Wire Association. ✦ ✦ ✦ ✦

THE Wire Mill personnel, regardless of its type of organization, must control the flow of work through the productive processes. The Wire Mill of the "good old days," where the wire drawer made his own dies, the foreman made up his own drafting practices and the superintendent was held responsible to see that the wire was made properly, comprised the simplest form of production control, but it left very much to be desired. The attention that any particular order received was in direct proportion to the amount of pressure that the customer brought to bear on the Sales Department. Under this system practically all orders eventually became rush orders, and yet little progress was made in getting the majority of the orders finished and shipped on the promised dates.

✦ ✦ ✦

THE advent of the war priorities and shortage of raw materials, together with the fact that wire in modern warfare plays a much more important part than ever before, brought about a condition which made it apparent that centralized planning or scheduling was necessary. Centralized planning simply meant **"planning the work and working the plan,"** the plan being made by specialized individuals rather than foremen and workmen trying to make it up as they went along.

IF we as human beings were infallible in **"planning our work and working our plan"** there would be no necessity for control. Since we are not infallible, control becomes essential. It must be applied to men, materials and methods. It must never, however, assume the responsibility of the supervisor by attempting to command.

✦ ✦ ✦

RATE setting, cost control, scheduling, planning, operational sequences, etc., are all functions of production control and any endeavour to cover such a broad field in one paper would place one in the same position as the new member of the Sales Department of a certain Wire Mill who arrived at the Superintendent's office one day. He stated that his superior had suggested he be allowed to spend a couple of days in the Wire Mill so he would be fully conversant with wire. The Superintendent referred him to an adage by an unknown author to the effect that "The Manufacture of Wire is a maze of infinite and intricate details, sometimes without rhyme or reason, but nevertheless pertaining."

Designated as Official Publication by the Wire Association

WE are learning, however, that all the functions of production control work to better advantage if they are organized under a central control. It has also been found by experience that there is less confusion and buck-passing where responsibility is definitely allocated and cannot be dodged.

✦ ✦ ✦

THE "Wire Mill of the good old days" organization did not know when it was in difficulty until after the trouble had occurred. In seeking to develop a better control which would be simple and yet make an attempt to forestall delays and trouble, we have developed one using the master production schedule. While our aim has been simplicity, we have found it a very difficult job to keep the control system simple.

✦ ✦ ✦

A VERY careful study of the factors causing delays, which would result in orders not being finished until after the promise dates, showed where the bottlenecks were. Some of these difficulties were traced to a lack of control of the ordinary functions of a Wire Mill. The truckers did not know when material should be moved. Foremen did not have process wire available in time to meet their promise, thus certain departments would fall behind schedule and subsequent operations were held up and wire was often stolen from one order to fill another.

✦ ✦ ✦

IN the past, control of a Wire Mill has been fully decentralized, the foreman and superintendent being the centres of responsibility. Each Department had its own method of producing its products, subject only to a promise date usually set by the Sales or Order Departments. As a Wire Mill expands and individual departments become larger, the task of planning and preparing for and supervision of production becomes so great that a planning or scheduling department must be set up.

✦ ✦ ✦

SCHEDULING and planning are functions of the control of production, and as such should be considered as a tool of management, used solely for the purpose of expediting material through the various operational sequences in such a way as to assist in the control of costs. If, for any reason, it fails to accomplish these results after a reasonable trial, it would be discarded the same as any other tool, the use of which is no longer economically sound.

✦ ✦ ✦

BEFORE any general preparation could be started in building up a scheduling system, it was necessary to know how much each productive unit would produce, taking into account the actual efficiency. Associated with the actual drawing capacity of the Mill, there are individual department capacities that should be ascertained. The factors involved may be listed as follows:

A. Drawing Capacity
- **1. Breakdown from #5 rod**
  - **(a) Low Carbon**
  - **(b) High Carbon**
- **2. Breakdown from Heavy rods**
  - **(a) Low Carbon**
  - **(b) High Carbon**
- **3. Redrawing of wire**
  - **(a) Hard Wire**
  - **(b) Patented Wire**
  - **(c) Coated Wire**

B. Department Capacities
- **1. Patenting**
  - **(a) Rod**
  - **(b) Wire**
- **2. Normalizing, Annealing, Spheroidizing**
  - **(a) Rod**
  - **(b) Wire**
- **3. Flat Rolling**
  - **(a) High Carbon**
    - **1. Fine**
    - **2. Heavy**
  - **(b) Low Carbon**
    - **1. Fine**
    - **2. Heavy**
- **4. Protective Coatings**
  - **(a) Galvanizing**
  - **(b) Tinning**
  - **(c) Coppering**
- **5. Oil Tempering**
  - **(a) Heavy**
  - **(b) Fine**

L. D. SEYMOUR

Born August 12, 1902, Hornell, New York. Received B.S. in Metallurgy, Pennsylvania State College, 1926. Until 1929 employed in the Physical Laboratory of American Steel and Wire Company, Worcester, Mass. Two years as Metallurgist with Reed & Prince Manufacturing Company. Four years with Jones & Laughlin Steel Corporation as Wire Metallurgist in their Aliquippa, Pa. plant. Became associated with the Youngstown Sheet & Tube Company early in 1934. In July 1938 became associated with the Steel Company of Canada, Ltd., Hamilton, Ont. Member of the Wire Association.

✦ ✦ ✦

AFTER ascertaining the departmental and equipment capacities, which are expressed in whole tons, except for continuous units, scheduling begins. Only 80% of the productive capacity of the equipment is used in direct scheduling to allow for slight inefficiencies, errors, rush orders and last minute changes.

✦ ✦ ✦

A DETAILED description of the scheduling routine now in effect is as follows:

✦ ✦ ✦

Mill Order — Specification Control

(See Figure 1)

MILL orders are sent to the specification desk and if no specification numbers are shown, it is necessary to select one from the specification book and copy full detail on the Mill Order form. If the Mill Order carries a specification number, it then only requires a girl clerk to transfer information from the specification book (Fig. 2) to the sheet. We show our specification numbers on invoices, which encourages customers to show this information when placing repeat orders. The more numbers appearing on the Mill Orders means less necessity of the specification section having to deal with new orders.

✦ ✦ ✦

THE Sales Department has a copy of the specification book and always enters numbers on the

customer's order upon receipt, providing the proper specification is recorded. All manufacturing departments have a copy of the specifications concerning their products, and the Cost Department has a complete set embracing all products. These specifications are kept up-to-date by change sheets issued by the Schedule Department.

✦ ✦ ✦

Mill Order — Raw Material Control

WHEN a Mill Order (Fig. 1) reaches this stage, it shows full manufacturing practice such as: size and quality of raw material, drawing, cleaning, heat treating and finishing detail. Too much care cannot be taken to give every instruction so that customer's order will be manufactured in the most efficient and economical way possible, (previous to having this detail assembled in our present specification, it remained in large measure with the foremen to proceed in their own way.)

THE Mill Order then passes to the stock control to determine if all or part happens to be available in the finished or semi-finished form. If it is impossible to provide from stock, the order continues to the rod Kardex to check for raw material. If rods are available the clerk stamps the Mill Order "Rods in Stock" and also gives the location of rods in the warehouse. A very special point is made of stating the exact location where all materials are to be found. While Mill Orders are still at the Kardex desk, they are referred to the register (Fig. 4) and each item given a number. This feature is very essential in the schedule routine, as it was found impossible to use tally numbers or those appearing on customer's order.

✦ ✦ ✦

IN the case of all Interdepartments such as Galvanizing, Nail Mill, Annealed and Patented Stocks, etc., the orders are issued by the schedule office and each one bears its register (Fig. 4) number. To sum up this raw material control is to say that every item is:—

(a) Checked for finished or semi-finished stock
(b) Given a registered number
(c) Checked for raw material and marked "Rods in Stock" or "No Rods."

✦ ✦ ✦

"No Rod" Mill Orders

THESE orders are filed in folders by quality and size and are quickly available when new stocks of rods are received and also for quick reference by the promise control. These "No Rod" orders are used to build up wire rod rollings, and are carefully marked accordingly.

✦ ✦ ✦

"Rods in Stock" Mill Orders

THESE orders are ready for scheduling and are treated as follows:—

(1) Orders which start and finish in the Heavy Wire Mill and do not call for processing other than drawing are referred to the control sheet for that department and given the "week number" which appears on the sheet selected as well as the number of the

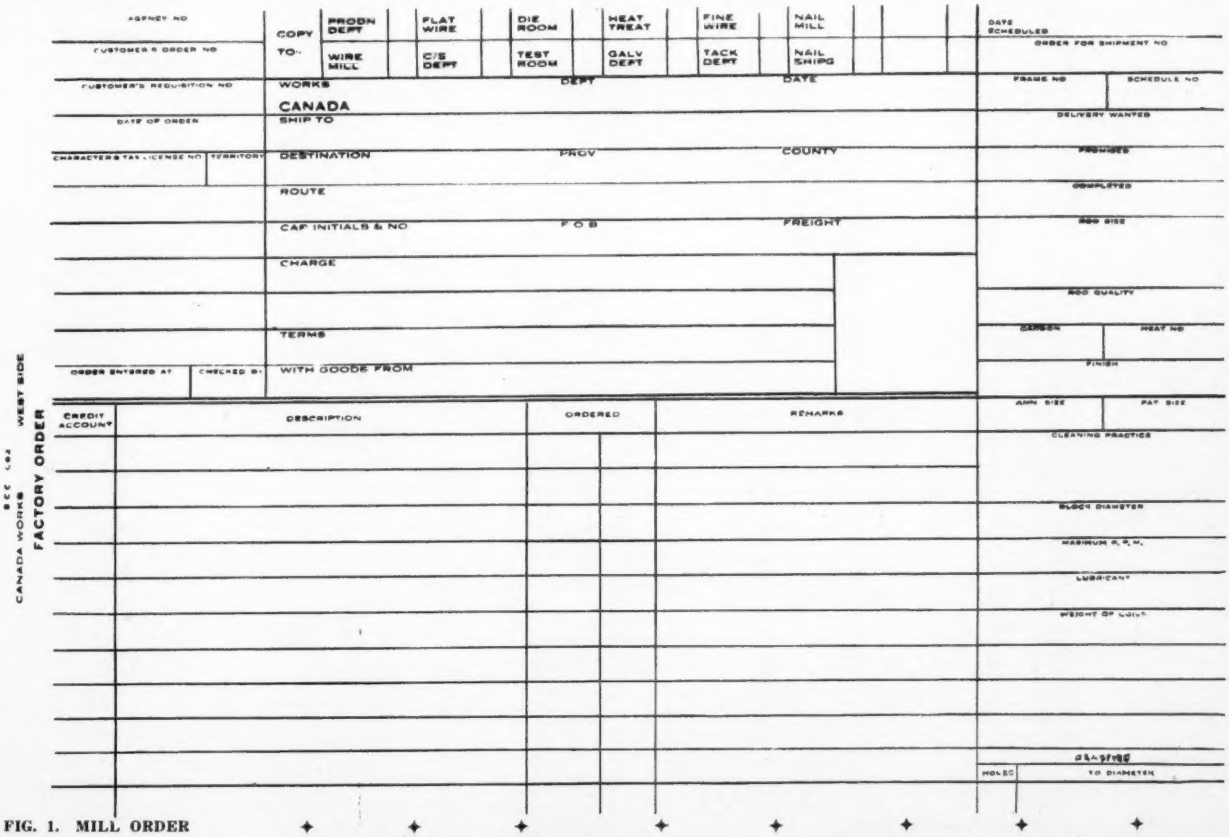


FIG. 1. MILL ORDER

s-976.

ACC'T. NO. _____ THE STEEL COMPANY OF CANADA, LIMITED SPEC. NO. _____

_____ CANADA WORKS _____ DEPARTMENT SIZE _____

APPROVED BY _____ ON _____ _____ PRODUCT

SPEC. NO.	WIRE		TRADE NAME	ROD					BLOCK DIA.	MAX. R.P.M.	LUB.	INTERMEDIATE PRACTICE					FINAL		SPEC. NO.
	GAUGE	DEC.		CARBON	SIZE	QUALITY	PAT.	CLEAN				Holes	Size	P & C	Holes	Size	Holes	Size	

SPEC. NO.	CUSTOMER	COILS	SPEC. NO.	CUSTOMER	COILS	SPEC. NO.	CUSTOMER	COILS

FIG. 2A. SPECIFICATION BOOK.

s-976.

TESTS

SPEC. NO	SIZE		ANALYSIS			TENSILE RANGE	ELASTIC LIMIT	TORSION 100 DIA.	ELONG.	RED. OF AREA %	ROCK.	OTHER TESTS	SPEC. ETC.
	DECIMAL	LIMITS	CARBON	MANGANESE	OTHER								

REMARKS

SPEC. NO.	CUSTOMER	REMARKS	SPEC. NO.	CUSTOMER	REMARKS

FIG. 2B. SPECIFICATION BOOK.

SIZE	QUALITY	HEAT NO.	CARB.	PHOS.	SUL.	MANG.	SIL.

MTH	DAY	RECEIVED		BALANCE		CLEAN	CUST.	OPEN STOCK		ALLTD.	MTH	DAY	RECEIVED		BALANCE		CLEAN	CUST.	OPEN STOCK		ALLTD.
		COILS	N.T	COILS	N.T	N.T.	N.T.	COILS	N.T.	N.T.			COILS	N.T	COILS	N.T	N.T.	N.T.	COILS	N.T.	N.T.

LOCATION

S. C. C. - C-150-A. WIRE ROD STOCK RECORD

FIG. 3. WIRE ROD STOCK RECORD.

machine group on which it will be manufactured. An entry is made on the master schedule sheet (Fig. 5) of all necessary information. After passing through this routine the scheduling information appearing on the Mill Order would appear as follows:—

"5349-34 (17 & 18)"

✦ ✦ ✦

THE number 5349 represents our Schedule Department number received from the register, 34 stands for the thirty-fourth week of the year, 17 and 18 identifies the equipment it will be drawn on.

✦ ✦ ✦

(2) ORDERS which are processed in more than one department follow the same procedure as outlined above, only it is necessary to arrange the scheduling in a little different way. For example, an order which requires break-down in the Heavy Mill, further drawing in the Redraw Mill, Annealing and Drawing to final size in the Redraw Mill, since annealing in this case is the "bottleneck" operation, the Mill Order goes to the control sheet for that department and receives the "week number" which we will say is 36. It then passes to the Heavy Wire Mill (Fig. 5) and Redraw Mill control sheets (Fig. 6) (each having separate sheets) and automatically receives week number 35 for break-down in the Heavy Mill, and week number 37 for final drawing the Redraw Mill. This Mill Order would show the following scheduling information if put through as first outlined:—

"5350-35 (Moto 5 & 6) — 36 (Anneal.) — 37 (8 & 10)"

✦ ✦ ✦

IF customer should ask for delivery promise, we would add on sufficient time to cover inspection, bundling, shipping, etc.

✦ ✦ ✦

FROM the foregoing it can be seen that every schedule Mill Order shows the following information: description of raw material and location in rod storage, full processing information including size and weight of coils, tie bands, tags, cleaning practice designated by code, week numbers, equipment numbers, and is now ready to be written up on production tickets. (Fig. 7).

C-152 - z-131.

THE STEEL COMPANY OF CANADA, LIMITED

Canada Works - Wire Mill

SCHEDULE REGISTER

DATE	REGISTER NO.	SCH. NO.	MILL ORDER NUMBER	MATERIAL	CUSTOMER	DEPARTMENT

FIG. 4. SCHEDULE REGISTER.

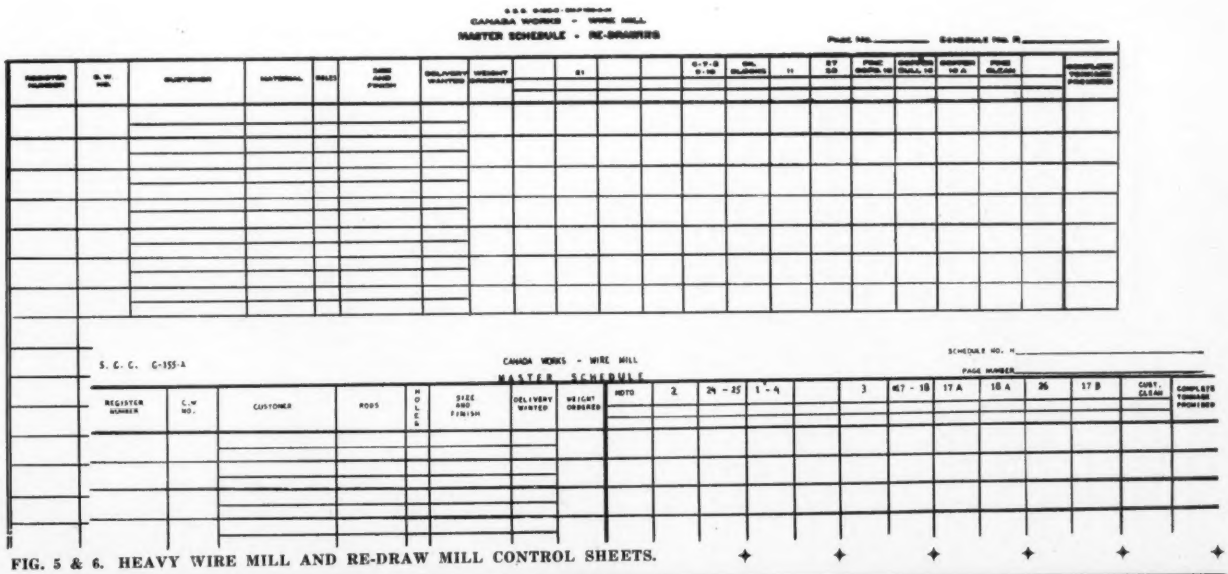


FIG. 5 & 6. HEAVY WIRE MILL AND RE-DRAW MILL CONTROL SHEETS.

Production Tickets — Schedule Office Routine

THE Mill Order goes to a clerk who writes up a set of production tickets (Fig. 7) designated to take care of the full processing. In the case of this order (5350) there would be four tickets:

(1) **Heavy Wire Mill—showing rod size, kind, etc., cleaning practice, number of holes, lubricant, finish, wire size, etc.**

(2) **Redraw Mill—showing wire size, kind, number of holes, lubricant, finish, wire size, etc.**

(3) **Annealing Department — showing size and type of wire, kind of annealing, etc.**

(4) **Redraw Mill — showing cleaning practice if any, wire size and kind, number of holes, lubricant, finish, final size, etc.**

✦ ✦ ✦

THESE production tickets when spread out and read together give the complete processing and routing through the Mill.

The Heavy Wire Mill ticket says: Make on frame moto-deliver to Frames 5 and 6—for annealing.

The first Redraw ticket says: Make on Frames 5 and 6—deliver to annealers —for Frames 8 and 10.

Annealing ticket says: Anneal furnace #2 — delivery to Frames 8 and 10 — for test.

Second Redraw ticket says: Make on Frames 8 and 10, delivery to test — for bundlers and shipping.

S.C.C. C156 ASM SETS 10-41

CANADA WORKS — PRODUCTION ORDER

UNIT _____ DATE _____

DELIVER TO		FOR
REG. SCH. NO.	MILL ORDER NO.	CUST. NO.
MATERIAL		FINISHED SIZE
HEAT AND STOCK		CUSTOMER
LOCATION	PROMISED DATE	AMOUNT

MATERIAL USED		HOLES	FINISHED SIZE	PROCESS
KIND	SIZE			
GREEN RODS				
PATENTED RODS WIRE				
BRT. WIRE				
ANNLD. WIRE				
SOFT DR'N BRT. ANN'D				

PART NO. _____ CUST. SPEC. NO. _____

WANTED		COMPLETED	
DATE	AMOUNT	DATE	AMOUNT

PROMISED ON RODS _____ ORDERED BY _____ CHECKED BY _____

FIG. 7. PRODUCTION TICKET ✦ ✦

✦ ✦ ✦

IN addition to above, each ticket bears register number 5350 followed by the week number in which the work was originally scheduled. The tickets are then filed in pigeon holes under the equipment specified and are ready to be picked up by foremen of the departments concerned.

✦ ✦ ✦

Production Tickets — Wire Mill

WHEN the operating foreman clears the tickets from the schedule office, he files them in a pigeon hole rack under equipment in his own office and therefore has a ready reference to the work available to him for the immediate future. Knowing what

S. C. C. - C-159-A.
CANADA WORKS - WIRE MILL
CLEANING & DRAWING SCHEDULE
Date _____ 19__

FRAME	REG. & SCHEDULE NUMBER	MILL ORDER NO.	CUSTOMER ORDER NO.	CUSTOMER PART NO.	DELIVER TO	ACCT. FROM	SIZE	KIND - HEAT	LOCATION	CLEANING PRACTICE	H.S.	SIZE - FINISH	ACCT. TO	WEIGHT	LUB. R.P.M. COIL SIZE WEIGHT	BALANCE	REMARKS
BLOCKS																	
2																	
24-25																	
4																	
BLOCKS																	
3																	

S. C. C. - C 159 A
CANADA WORKS - WIRE MILL
CLEANING & REDRAWING SCHEDULE
Date _____ 19__

FRAME	REG. & SCHEDULE NUMBER	MILL ORDER NO.	CUSTOMER ORDER NO.	CUSTOMER PART NO.	DELIVER TO	ACCT. FROM	SIZE	KIND - HEAT	LOCATION	CLEANING PRACTICE	H.S.	SIZE - FINISH	ACCT. TO	WEIGHT	LUB. R.P.M. COIL SIZE WEIGHT	BALANCE	REMARKS
21																	
6																	
7																	
8																	
9																	
10																	
BLOCKS																	
11																	

FIG. 8 & 9. DAILY CLEANING AND DRAWING SCHEDULE ✦ ✦ ✦ ✦ ✦

work is at hand and also coming up is very important in the Heavy and Redraw Mills since these are fast producing departments (especially the Heavy Mill) for a large tonnage is handled in the space of 24 hours. From these tickets the foreman selects a volume each day to represent twenty-four hours production. He is especially qualified to select this work since he knows the full situation of his man-power and the condition of his equipment.

✦ ✦ ✦

IF it so happens that any piece of equipment is under-scheduled, the foreman can easily bolster the tonnage by adding new tickets during the day, and likewise hold back on his daily schedule if equipment happens to become over-scheduled. In the lower lefthand corner of the production ticket there is space provided for the exclusive use of the foreman, and he orders up his work by writing the number of pounds to make and the date he wants it scheduled. The tickets thus scheduled by the foreman are filed in a small visible sorter, by equipment, and are now ready to be written on the daily cleaning and drawing sheet by the schedule office clerk.

✦ ✦ ✦

THIS routine demonstrates how the foreman—in this case the Wire Mill foreman—picks his own work up in the schedule office, files it in his own office according to equipment, and schedules it day by day on his own department. There is considerable advantage in having the schedule office planning each department by the week, and then allowing the foreman to put the work through day by day as he sees fit. There is little or no trouble in looking after emergency war orders, replace orders, etc., since each current week has an available cushion to take care of just such matters.

✦ ✦ ✦

Production Tickets — Cleaning And Drawing Sheet

A SCHEDULE office clerk, situated in the Wire Mill office, transcribes the information from the production tickets, as marked by the Wire Mill foreman, onto a daily cleaning and drawing sheet (Figs. 8 & 9). The complete information as shown on the production tickets is reproduced on the daily sheet, and all work in the mill is done as outlined on this sheet. The quantity appearing on the individual tickets is, in a large majority of cases, ordered up in full the first time, but still there are quite a few cases when it is necessary to order up in part lots. A ticket might specify 150,000 lbs., and instead of putting this amount on in one lot, the foreman will select 50,000 lbs. for three days, or even cut it down to 25,000 lbs. for six days. It all depends how much work is on hand for that particular piece of equipment.

✦ ✦ ✦

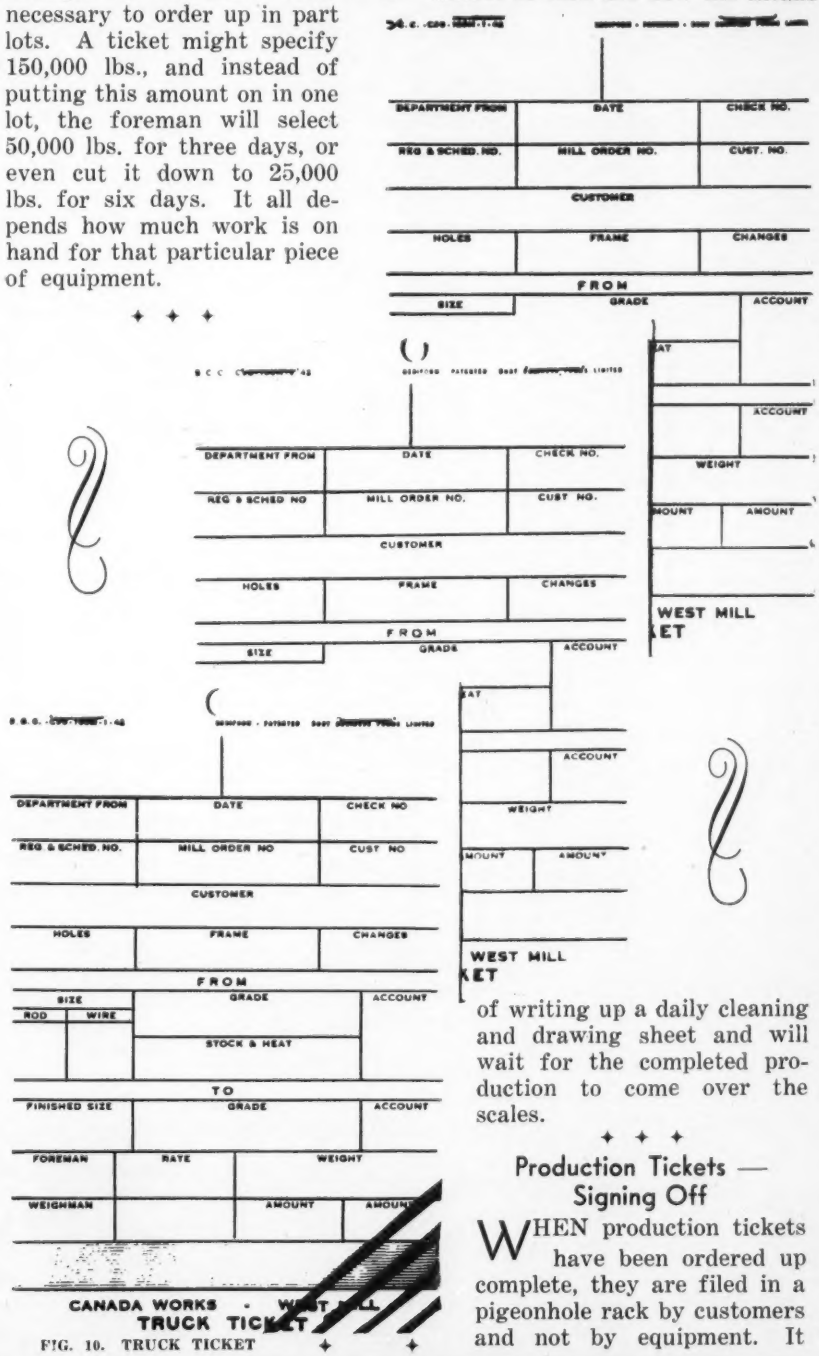


FIG. 10. TRUCK TICKET

ORDERS which are not ordered up in full the first time are called "Repeaters" and are put back in the pigeonhole rack for further attention. Up to this stage we can see that the Mill Order copy was used to get all the information together, telling how to make and schedule the material and be the basis for writing out production tickets. These production tickets in turn are now the means of writing up a daily cleaning and drawing sheet and will wait for the completed production to come over the scales.

✦ ✦ ✦

Production Tickets — Signing Off

WHEN production tickets have been ordered up complete, they are filed in a pigeonhole rack by customers and not by equipment. It

may be recalled it was necessary, in the beginning, to classify the "No Rod" orders under raw material, and likewise those orders for which we have material were measured in terms of equipment. Now, since the orders have passed through these two stages, we find it necessary to control them under the customer's name. There are separate pigeonholes for the larger customers, and the miscellaneous customers are filed alphabetically. This set-up lends itself to checking on individual customers which, of course, is a very important part of our responsibility. It is up to the clerk to keep going over these scheduled tickets, and bring to the foreman's attention those cases where delays have taken place.

✦ ✦ ✦

A COPY of every truck ticket is given to the clerk in the foreman's office and he signs these off on the production tickets. In the lower right-hand corner of the production ticket there is special provision to record these entries. The first procedure was for the foreman to mark down what he wanted made, and against these entries we now score off the production as it comes through, giving the weight involved and the date. When production tickets show that the full weight has been produced, they are then sent to the schedule office, and in turn clear the Mill Order copy. These Mill Order copies are then filed by customers, and the production tickets filed numerically. It will be remembered that each item scheduled has its own register number, which means the full set is automatically filed together when complete. This is a great advantage when necessary to refer to these tickets on future occasions.

✦ ✦ ✦

Cleaning and Drawing — Operation in the Mill

THIS sheet (Fig. 8 & 9), as the name implies, is for the use of the Cleaning and Drawing Departments. It gives full particulars, schedule and customer's number, name of customer, full information on raw materials and the way it is to be processed. It also tells the location of the raw material and where the finished work is to be delivered. A copy therefore goes to the Cleaning House and a further copy to the gauger on the Wire Mill Floor. A third copy goes to the despatcher's desk and he writes out tickets for those items which come from semi-processed stock. These tickets are called "Orders to Move." (Fig. 10). The three types of tickets are not only used for the movement and production of goods, but also for pay and Kardex purposes.

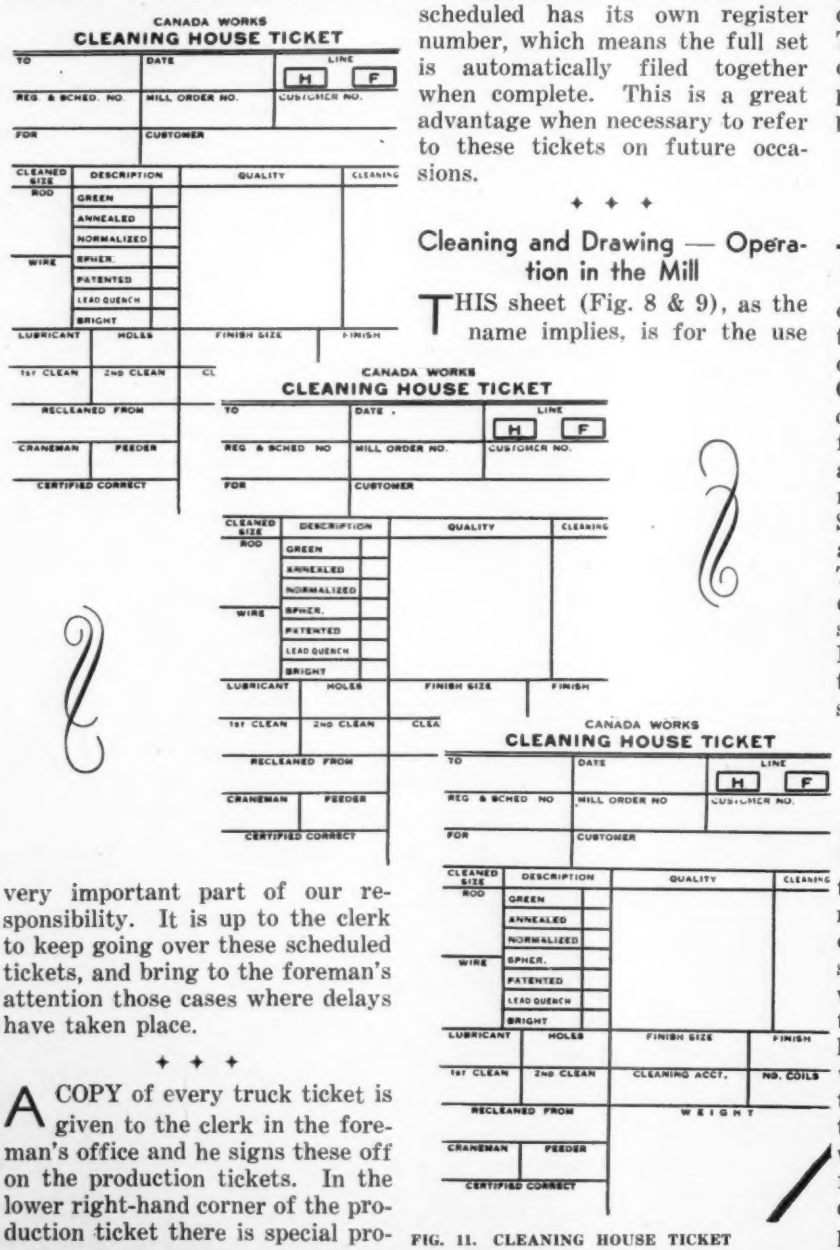


FIG. 11. CLEANING HOUSE TICKET

Cleaning Tickets

THE cleaning tickets (Fig. 11) are typed out in the schedule office. If an item is such that the full amount can be picked up on a hook, only one ticket is issued. On the other hand, if it takes two or more hooks to deliver the rods from the shed, sufficient tickets are written up to cover. When the rods are hooked out of the Rod Shed, a cleaning ticket is attached and goes forward to the scales. The weight is printed on all three copies by an electric automatic scale, the original copy for the Pay Department, the second copy to the Kardex, and the cardboard stub stays with the load.

✦ ✦ ✦

Truck Tickets

IN the meantime, the Wire Mill gauger has made out his truck tickets (Fig. 10) and has them ready to pass out to the wire drawers. Since the cleaning tickets specify the frames on which the work is to be done, it is comparatively simple for the stockers to keep the flow of rods going to the wire benches, and upon arrival, the wire drawer already has his tickets to complete the work. The wire drawer will always have sufficient tickets to cover each individual load of finished work he produces. When the wire drawer

puts his check number on the ticket, the load is picked up by the truckers and taken to the weighing scales. The weigh scale clerk writes the net weight on the ticket, keeps four copies, and hands two back to the trucker. The trucker, in turn, attaches the stub to the load and makes delivery to the station designated. The other copy is given to the Receiving Department and is a notice to the foreman as to the deliveries being made to his department. The weigh scale clerk sends the original copy to the Pay Department, the second copy to the schedule clerk in the Wire Mill office, the third copy to the wire drawer, and the fourth to the Test Department, if one is required by them.

C-89

THE STEEL COMPANY OF CANADA, LIMITED

CANADA WORKS - DIE ROOM

DIE ORDER

CHECK NO. _____ DATE _____ 19___

WIRE MILL

RD. SIZE	CLASS	CARBON	NO. HOLES	R. P. M.

FIN. SIZE	WT. OF COILS	DIA. COILS	WT. TO DRAW

CUSTOMER OR DEPT

ORDERED BY

DIE ROOM - DIES ISSUED

HOLE No.	SIZE	HOLE No.	SIZE	SICLE No.	SIZE
1		4		7	
2		5		8	
3		6		9	

ISSUED BY

FIG. 12. DIE ORDER

✦ ✦ ✦

IT has been pointed out that in processing an order, control of raw materials and the actual scheduling are of prime importance, but the handling and transporting of tens of thousands of tons in a limited area is of still greater importance. No matter how well the other things are done, the whole system can collapse if the movement of these goods becomes disrupted and is not covered by an airtight control.

✦ ✦ ✦

"Order to Move" Tickets

THE despatcher who is located in the Wire Mill office selects out such items as will not be covered by cleaning tickets and writes out "Order to Move" tickets (Fig. 10). This involves chiefly annealed and patented stock, rejected materials for reprocessing, etc. Work of this kind is weighed with the original copy going to the Pay Department, and copies to the departments if required. On these transactions, it is not necessary to have as many copies as on truck tickets involving finished work.

Die Department — Test Department

IT has been found an advantage to send full information to these two departments, a copy of all Mill Orders, cleaning sheets. In the case of the Die Room (Fig. 12). they can prepare dies from the Mill Orders and have them ready for delivery when each particular item appears on the daily cleaning sheets. The Test Department uses the Mill Order copy for reference and finds it very useful when the material reaches that department. They also pay special attention to the daily cleaning sheet as it shows special information in regards to testing. A copy of all truck tickets is sent to the Test Department and offers a good record of all material received by them. They, in turn, pass these copies to the bundlers, which completes the entire routine.

✦ ✦ ✦

Report of Completed Work to Shippers

THE bundling room supervisor reports all the finished work to the Shipping Department. This report is made out on a special form and gives such information as customer's name, customer's number, tally number, size, kind and amount of wire. The foreman shipper is thus enabled to select the tally specified and thereby allow his men to lay the reported goods off for shipment. The Bundling Room supervisor and Shipping foreman each receive a copy of the daily cleaning sheets and are able to see what work is on the way through and also check back for additional information if necessary. These two departments work very closely together as a result of having full information on the work in hand.

✦ ✦ ✦

Re-scheduling of Rejects

IN such cases where the Test Department rejects wire and it cannot be shipped on the order for which it was intended, they report these back to the schedule office. Full information is given such as customer's name, number, schedule number, size, quantity, and reason for rejection. These items are picked up in the schedule office and put back on as new orders. If raw material is in stock, the production tickets are issued at once and preference given in scheduling. We leave a cushion on all schedule sheets to take care of just such items. If raw material is not available, the order is placed in the "No Rod" stock file and is taken care of on the next wire rod order.

✦ ✦ ✦

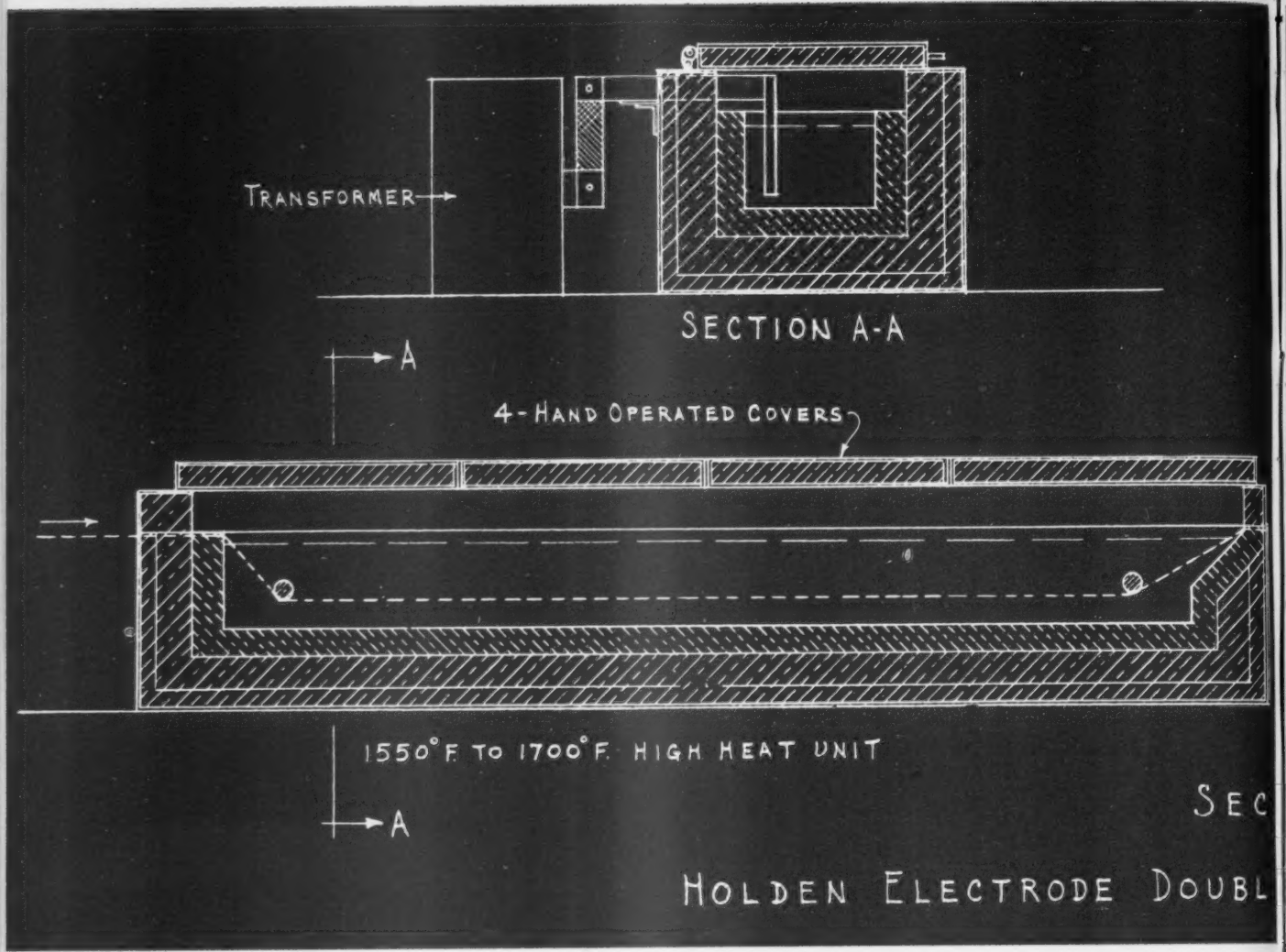
Scheduling of All Finishing Departments

ALTHOUGH the scheduling routine as outlined above has dealt chiefly with the Wire Mill, process and finishing departments are scheduled in a similar manner.

✦ ✦ ✦

THE production office sends out the weekly schedule. Truck tickets are issued and follow the work through to each subsequent department until final report is made to the shipper.

Special to WIRE MANUFACTURERS



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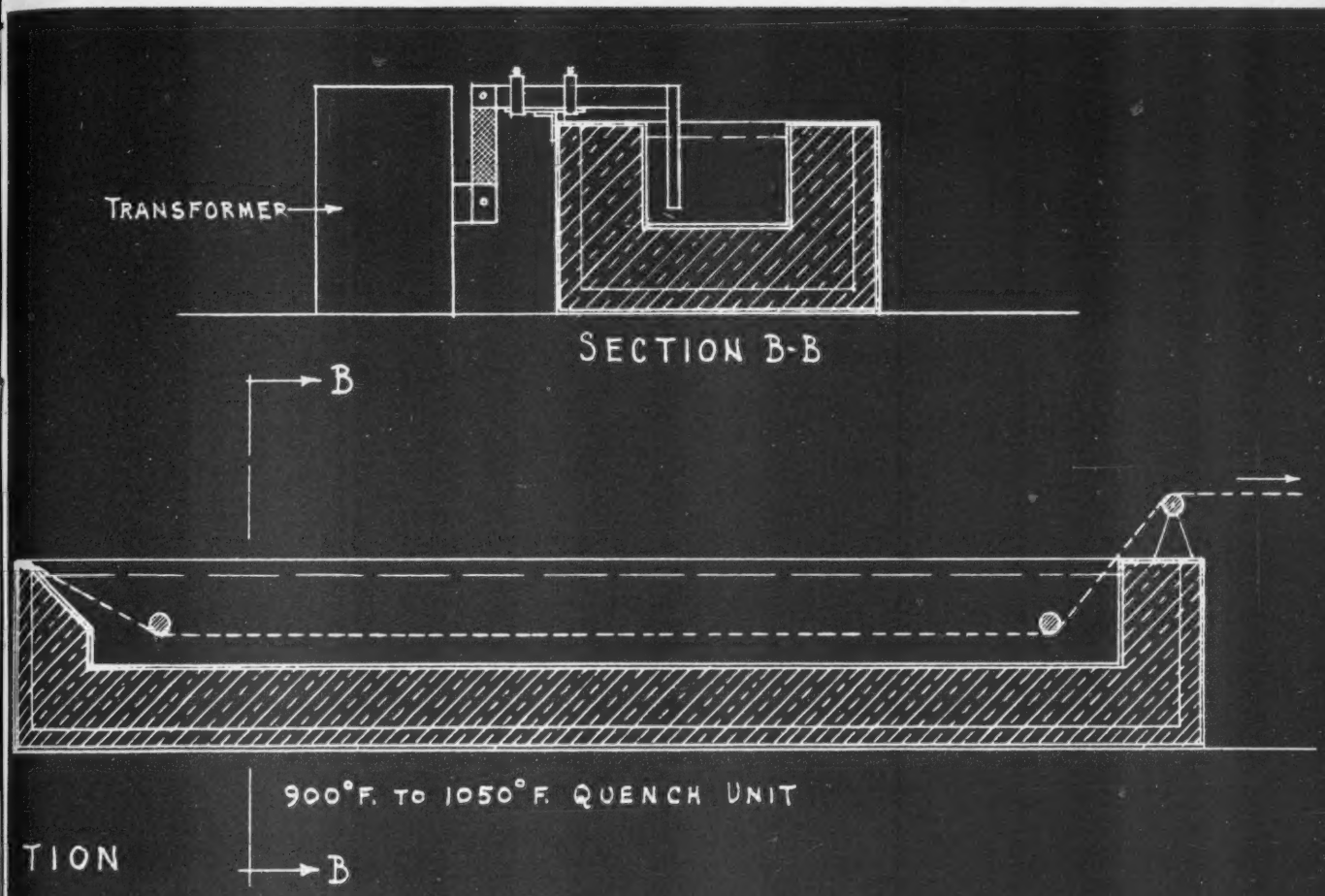

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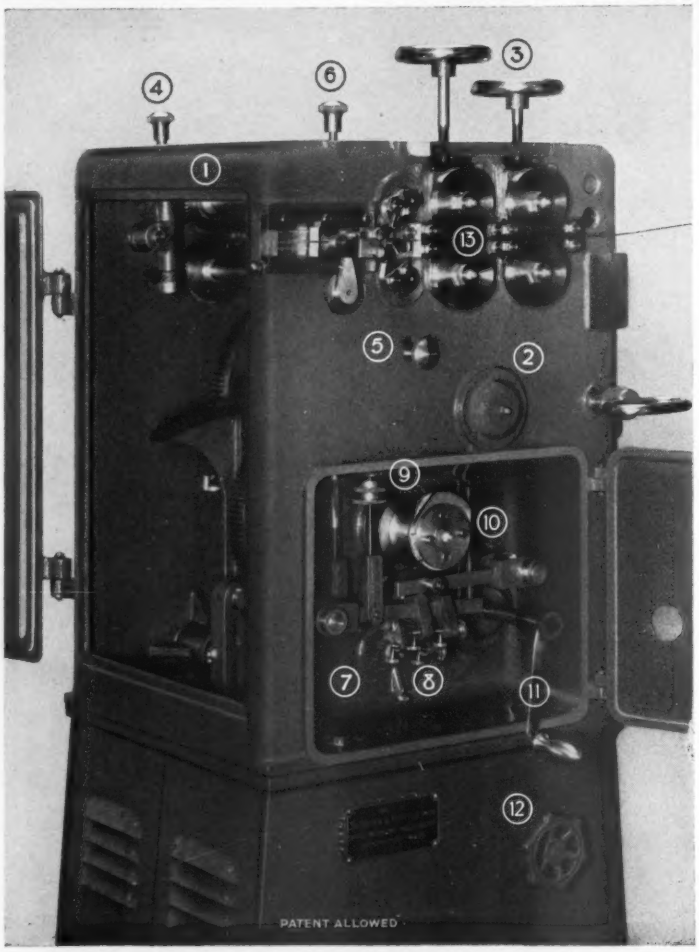

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5- Pitch and

6- Diameter control readily accessible.

7- Pitch and Diameter Cam control located in recess in front housing.

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10- Combination cam hub for pitch and diameter cams, completely removable from machine.

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Trouble Shooting on Bronze and Steel Weaving Wire

By L. D. Granger,
Treasurer,
American Wire Fabrics Corp., New York, New York

This paper will stress the necessity of obtaining a uniform wire if the best quality of wire cloth is to be produced. A specific case of lack of uniformity will be noted and a special testing jig described, by the use of which the facts in the case were demonstrated with sufficient emphasis to cause drastic action on the part of the mill supplying the wire to correct the difficulty.

IT is an old saying that "the proof of the pudding is in the eating thereof" - - - Just as true is the fact that the proof of quality of weaving wire is in its weaving.

✦ ✦ ✦

IN spite of its seeming a very simple operation, wire weaving has just as many problems, and can go wrong in just as many ways as any other fabricating operation. Looms may get out of adjustment and require resetting of cams and heddle shifts, workmen may be careless and fill the cloth full of uneven spaces particularly at bobbin change points, rough handling may damage selvages, and last but not at all least, the wire itself may not be all it should. If the nearest possible approach to perfection in the finished cloth is our goal, all deviations from perfection in all the essentials of manufacture must be kept at a minimum.

✦ ✦ ✦

MECHANICAL detail and material handling are not to be considered here — only wire, and the many ways in which it may be found wanting, how the condition may be detected, and how it may be corrected.

✦ ✦ ✦

THE ideal weaving wire is of course tough, so that it will take all the bending and crimping necessary, uniform in size, roundness, color, and stiffness—in other words, perfection itself.

✦ ✦ ✦

UNFORTUNATELY, few mills make such wire, and it becomes necessary for the weaving mill either to weave the wire as received, or to establish standards and test the wire before warping or winding, to be sure that the woven cloth will be satisfactory.

✦ ✦ ✦

THE desired quality of cloth is simple. It must have even spacing both in warp and filling, must lay flat without buckling, and must have a uniform and even texture. If it is deficient in any one of these qualities, and if the mechanical features of the looms are satisfactory, the wire must be at fault, and in most instances, we are fully assured that everything mechanical is perfection itself, thus leaving the wire the only possible offender.

✦ ✦ ✦

IN many cases this may be so, and we have spent many hours in testing wire and devising means for locating trouble. We find the following as possible defects in wire, all of which will adversely affect the quality:

Brittleness
Off Gauge
Out of Round
Uneven Color
Uneven Temper or Stiffness

✦ ✦ ✦

Brittle Wire

BRITTLE wire, of course, gives a very evident proof of its presence, as it will break and will not take the crimping caused by the successive motions of the heddles. Also brittle wire will not stand the shock of the beating up of the frame, and wires will break out. The remedy is, of course, obvious, and a simple kink test or in other cases running the wire through a set of crimping rolls will quickly show up the condition before the wire gets on the loom.

Off Gauge and Out of Round Wire

OFF Gauge and out of round wire will usually weave without difficulty, but will often produce an uneven texture in the cloth.

✦ ✦ ✦

Uneven Color

WIRE cloth is a fine reflector of light. The crimps produce apices which are shiny, and, if not in perfect alignment, are very potent evidence that all is not well. Off gauge wire produces lumps or waves, and out of round wire causes reflections in different angles so that instead of a smooth even surface being provided, the reflections are haphazard. This may not affect the practical use of the cloth, but if appearance is the criterion which your competitors' salesmen say it is, this unevenness is, of course, to be avoided. In precision cloth especially, absolute roundness is a necessity as in a Bureau of Standards test the openings are measured under a considerable magnification, and minute variations become very evident.

✦ ✦ ✦

THE test is of course using the micrometer and listening for the click as the wire is rotated. Some people call this using the micrometer as a monkey wrench, but it really isn't necessary to use very much pressure.

✦ ✦ ✦

SINCE the advent of carbide dies, out of roundness and off gauge have been very much reduced, and complaints from this source minimized.

✦ ✦ ✦

Uneven Temper or Stiffness

THE question of unevenness of temper or stiffness is perhaps the most usual cause for complaint,

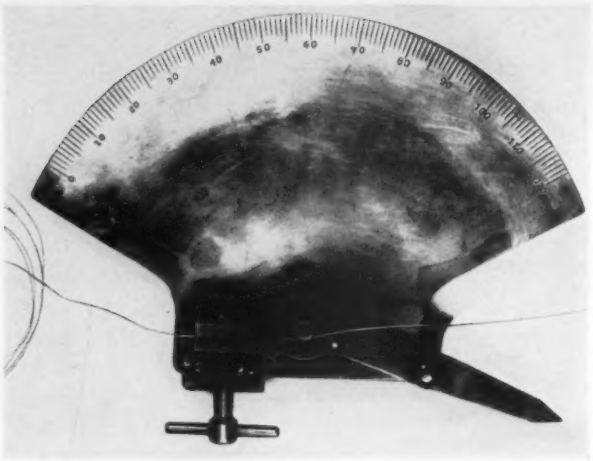

Fig. 1. Showing wire in place.

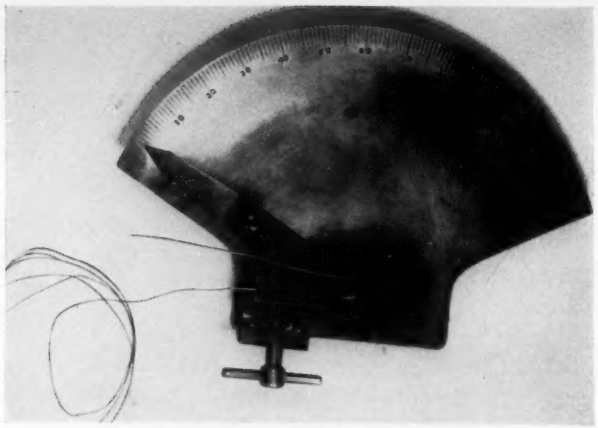

Fig. 2. Showing wire bent around pin.

and is one on which we have done a considerable amount of work to determine causes and apply remedies.

SOME time ago we saw produced in a special grade of cloth a beautiful "pattern." The filling was striped light and dark every half inch, the stripes repeating almost as if made on purpose. The wire itself looked perfectly normal, even color, and felt fairly uniform to the fingers in bending. Testing ends of bundles for tensile showed normal variations, but the cloth belied the test.

FINALLY, we took a bobbin that was producing "pattern" cloth and tested it for tensile strength every two feet, and plotted the figures. The result was a practically perfect sine curve with a variation of about 30,000 pounds per square foot between high and low values, and a range of about 40 to 50 feet between peaks. Tests on several other bad acting bobbins gave similar results, and then it was noted that if the cloth were turned around, the light streaks became dark and vice versa. Further examination under a low power binocular microscope showed a variation in the crimp, a deep crimp in one area and a shallow crimp in the other.

IN this way the cause was definitely determined to be a rythmic variation in the stiffness of the wire and a consequent variation in the reflection of light from the crimps.

FURTHER investigation and a simple mathematical analysis showed that the length of the finished wire between peaks of high tensile when referred back to the diameter of the coil at the last annealing point produced a perfect check, indicating an uneven annealing condition in the process wire.

THE matter was then taken up with the mill drawing the wire, several bundles of annealed process wire were tested, and the same cycle of high and low tensile found. From then on it was an easy matter to investigate the annealing practice and to prove that excessive shingling in an endeavor to produce more tonnage had caused the outside of the bundles nearest the pot to become overheated, and therefore to have a lower tensile, which of course carried through to the finished wire. The wire mill practice was corrected, and the washboard cloth ceased.

Testing

IT was rather difficult to make so many tensile tests at the weaving mill, as the testing machine was homemade and rather awkward, so we were reminded of a stiffness tester used in connection with some special spring wire.

THIS consisted of a brass quadrant with a small vice to hold the wire and a pointer with a projecting knob which would bend the wire around a definite radius. (Figure 1) The wire was clamped, the pointer swung to the O point, (Figure 2) and then the resulting deflection measured from the recoil of the wire. (Figure 3) A uniform wire not varying more than three degrees on the scale was found to give uniform cloth, and the test was adopted as standard for mill use.

(*Please turn to Page 628*)

Fig. 3. Showing pointer indicating recoil.

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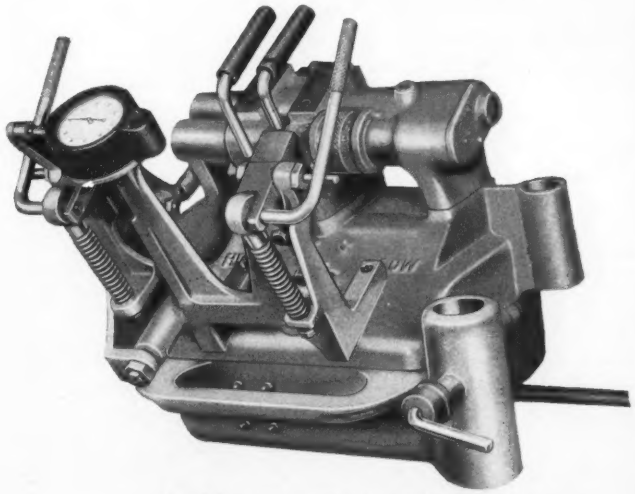

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A WELDER FOR EVERY PURPOSE

Reducing Accidents in Wire and Wire Products Operations

By R. H. Ferguson,
Manager of Safety,
Republic Steel Corporation,
Cleveland, Ohio

Accidents are probably the greatest single preventable cause of lost war energy. The real job for safety is done by the foreman and when he carries out his part real safety results are forthcoming and accidents reduced. ✦ ✦ ✦ ✦

MOST of us are now really conscious of the shortage of labor in this country; most of us realize that this problem will be much more serious before the turn of the year. With this thought in mind your committee believed that a discussion such as we will present here this morning might prove helpful in furthering the program to conserve man-power in our plants—particularly from such needless losses as those experienced because of accidents.

✦ ✦ ✦

Statistics

THE accident facts on your industry, as compiled by the **National Safety Council,** will prove interesting. The frequency rate, and by frequency we mean the number of accidents per million man-hours worked, for the wire drawing plants in this country for 1941 was 16.61; for the Steel Industry that rate was 7.02; for all Industry, 15.19. The severity rate, that is days lost per thousand hours worked, during the same period for the same plants in wire drawing totaled 1.30; for the Steel Industry, 1.75; for all Industry, 1.53. There is still much work to be done in preventing accidents on the jobs.

✦ ✦ ✦

SEVERAL fine safety records have been established by the Wire Drawing and Wire Products Industry, however, and these should prove of interest. In wire drawing the **American Steel and Wire Company Plant at Joliet** worked an all time record of 6,442,278 man-hours without a lost time accident. In Wire Products Manufacturing, **Westinghouse Electric and Manufacturing Company—Lamp Division of Bloomfield, New Jersey,** worked 1,429,350 man-hours without an injury. These records are real achievements for production with safety and show that accidents can be prevented.

ROBERT H. FERGUSON,
Manager of Safety, Republic Steel Corporation, Cleveland, Ohio.

Mr. Ferguson has had a broad experience in Safety work, coming to Republic after serving as Staff Safety Engineer for the National Safety Council. He is now serving as President of the Society of Ohio Safety Engineers, as Vice-Chairman of the Metals Section of the National Safety Council, and as a member of the Executive Committee of the American Society of Safety Engineers.

TODAY as never before in the history of our country the importance of accident prevention work is being brought to the attention of the American public. While leaders of Industry have long realized the necessity for real Safety work, carried out on the job, the real significance of the death and injury toll from accidents, not only from pain and suffering to the injured but from an economic standpoint as well, is beginning to be forceably brought to the attention of all.

✦ ✦ ✦

ACCIDENTS are probably the greatest single preventable cause of the lost war energy. Accidents, according to the **National Safety Council,** in 1941, caused the death of 102,500 persons in the United States. Forty thousand of these were killed in motor vehicle accidents; 31,500 in the home; 18,000 met death in Industry. In addition 9,300,000 suffered disabling injuries which took them away from their work.

✦ ✦ ✦

FIGURES such as these, while astounding, are meaningless unless some accident has struck home—but suppose we interpret these accident losses in terms of lost war effort. Accidents during 1941 cost us 460,000,000 man-days of productive labor. Two-hundred-thousand soldiers, sailors or marines could have been supplied with war equipment produced in the time lost through these accidents. The man-days lost would have built 20 battleships and 100 more destroyers that will never see the water. It would have built 9,000

bombers that will never fly—it would have given us 40,000 more tanks—that will never crash the enemy lines.

✦ ✦ ✦

IT is no reflection on our boys in uniform to say that this war will be won or lost by the people who build the weapons as well as by the men who use them.

✦ ✦ ✦

THESE losses cannot be recovered. Our job now is to roll up our sleeves and see just what can be done to prevent accidents in the future—and then do it.

✦ ✦ ✦

Planning the Safety Program

NO job can be carried on properly unless it is planned thoroughly. Our first suggestion is that you review your present safety program in detail. Be sure it fits your present day needs and that it has been adjusted to fit your present day business. I believe we are agreed that safety work must necessarily be a continuous never ending program if we are to get results. It cannot be carried on now and then, when you get time for it, but must be made a definite part of your operations. After all safety is an operating problem—accidents are mistakes—and safe and efficient operations go hand in hand.

✦ ✦ ✦

WE suggest a review of your program because a few changes may be useful in "pepping up" the work. This added "pep" is the "spice" that puts life into a subject which it is sometimes difficult to get across to men. The safety job should be so organized that it is fully understood that management has accepted the responsibility for accident prevention. Active participation by the manager or superintendent means everything because the supervisory force and the men want to do the job the way the boss wants it done. Passive or half-hearted work by management on this score will not bring desired results.

✦ ✦ ✦

THE responsibility for developing and "pushing" the safety program should be given to a supervisor who is really interested in the job. In smaller plants this man may have other duties but in the larger organizations safety is a full time job. Don't give the job to an already overworked individual. The reasons are obvious and consequently let's make the man a safety engineer who really has ideas and will be allowed to develop them.

✦ ✦ ✦

Safety Committees

SAFETY Committees composed of top supervision should meet at least once each month to discuss the plant safety work. The boss should act as chairman of such meetings. Each department head should meet at least once each month with his foremen and discuss plant and departmental safety problems. Each foreman should meet at least once each month with his men to discuss specific problems of job safety. All such meetings should be planned so that the safety educational material and instructions are specific and definite. Don't let these instruction periods drag. Make them interesting. It must be understood that such meetings are only for policy and educational purposes and to develop interest in Safety. The actual safety work must be carried out on the job. We must "practice what we preach" and this goes for supervision as well as the men.

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ALONG with the safety meetings, of course, will be carried the regular visual program of safety posters in neatly arranged well maintained bulletin boards. If these displays are careless, that attitude most certainly passes down the line. Many plants today supplement visual educational work with safety pictures, motion pictures and other such items to build up and sustain interest.

✦ ✦ ✦

THE physical protection of the plant must have continuous attention. Guarding must be thorough and complete; hand-rails kept up to standard and maintained; belts and gears guarded. Floors should by all means be kept in good repair. There are many more suggestions which might be made but these can serve to start the program moving.

✦ ✦ ✦

TOO many safety programs stop short of these few items we have mentioned—but this is only the real start. With the guarding program effective and the safety meetings on schedule the real safety education job can now get underway.

✦ ✦ ✦

Rules and Regulations

SAFETY Rules and Regulations will probably be found in most plants. But too many plants have the rules and pay little or no attention to them. A few safety regulations properly administered and thoroughly enforced are much better than a book full of instructions that are not applied to the job.

✦ ✦ ✦

RULES are usually set up as the result of an injury—perhaps serious, perhaps only a near accident—in order to prevent a recurrence. They may, in some instances, be a negative approach but rules are absolutely essential. Rules on Safety, properly stated and explained to employees, teach the hazards which may be expected. Thus from the experience of the past the worker of the present day may gain knowledge of previous accidents to a profit. To be effective, rules must apply to all employees including supervisors. Enforcement must be whole-hearted—not slip-shod—but before enforcement every foreman should be sure that his men understand just what is expected. Rules should be reviewed at regular intervals in safety meetings and on the job. Men should be encouraged to discuss and ask questions concerning the instructions, for only in this way will they be fully understood.

✦ ✦ ✦

Typical Accidents

SUPPOSE we consider a few accidents which have occurred in wire drawing and wire products plants.

✦ ✦ ✦

IN rough stock storage there are many potential hazards—serious hazards, but all easily control-

led with the application of a little common sense and practical instruction. While unloading bundles of bars from gondola cars our instructions are that men must leave the car when the craneman is ready to hoist the lift. These rules were set up because a man did not get in the clear on one such job and when the lift was taken up it swung to one side and he was caught between the lift and the car. The injury was serious. How simple is the application of real accident prevention principles and how easy to prevent such an accident? Piling rounds or bars at any time can be hazardous. In handling rough stock, proper racks are essential. Even then men sometimes pile lifts too high and not always parallel. In picking up such lifts, hookers must be sure to keep lifts in balance or in line and to keep in the clear in case the lift should swing. Recently one of our hookers placed the crane chains of two different lifts on the crane hook to be hoisted — of course, he thought he had the chains from one lift—but when the crane hoisted the lift was pulled over onto him and a serious injury resulted.

✦ ✦ ✦

INATTENTION while moving over rough stock may cause trouble. One hooker working on top of steel paid no attention to the spreader when he unhooked a lift—actually turned his back to it—but the chain on the spreader caught on a wire on top of a pile as the spreader was pulled up. This caused the spreader to swing toward the hooker. He jumped ten feet to the ground. Result — one broken leg and a trained man out of the plant for several months.

✦ ✦ ✦

THE problem of guiding lifts of bars, from a safety standpoint, presents more difficulty than may at first be suspected. We have instructions that men must keep their hands off lifts. The reason is that too often while guiding a bundle their fingers get in between the bars and a sudden shifting of the lift means crushed fingers or hands. We use short hooks for this job.

Fig. 1. Handling small quantities of acid for test purposes presents some difficulty. Because glass bottles break and acid affects wooden supports easily, this stainless steel rubber-covered bottle with a vented cork was developed. It has proved most successful. ✦ ✦ ✦

✦ ✦ ✦

LOOSE or ragged sleeves, dangling aprons or apron strings and neckties are just about as deadly as the hangman's noose. These articles of clothing catch in moving machinery and the victim is quickly pulled into revolving equipment. The results are usually fatal. Most experienced operators will tell you that it is poor practice to attempt to take a snarl or tangle out of wire without shutting down the machine. And this is absolutely right—but from the injuries occurring from this source you may sometimes wonder whether the operator follows the practice he knows to be safe.

✦ ✦ ✦

WE have a rule in wire drawing which may be stated as follows: "Before starting work see that all safeguards and safety devices are in place and operative. Report any defects promptly to your superior." Now rules and instructions mean little unless enforced by supervisors and obeyed by men. This rule is very plain and simple yet not long ago an operator neglected to check his safety stop. His gloved hand caught on the wire and he was pulled up against the block when the safety failed to operate.

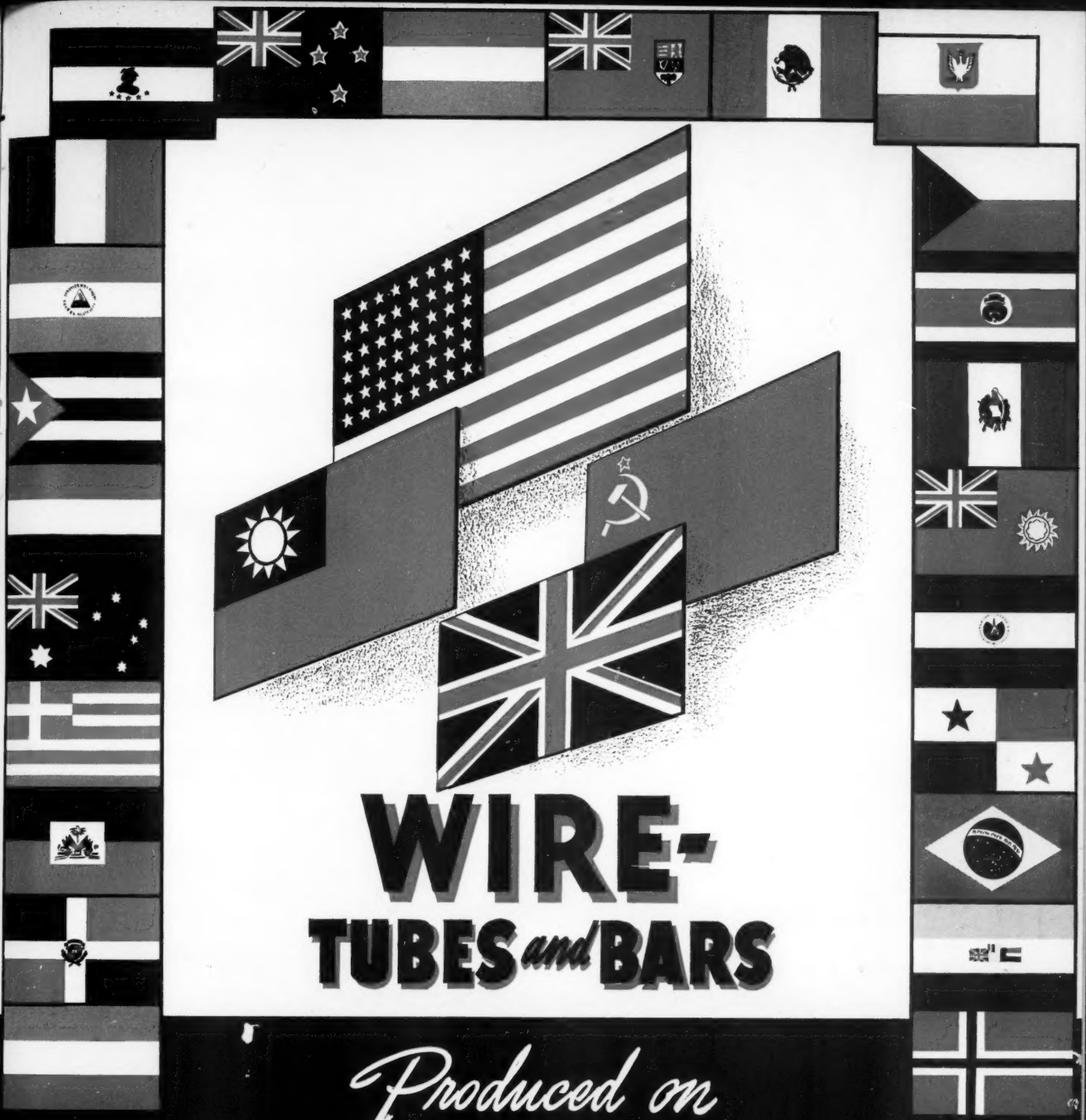
✦ ✦ ✦

ROUNDS on the entry table of a straightener or even on the inspection table will furnish us with another type of accident — unless prevention conditions have been taken care of properly. Usually the steel moves toward the operator and too many injuries have occurred because of a failure to place or properly maintain table stops. When this happens and the steel rolls over the table the operator or the inspector usually sustains broken bones in his legs or feet.

✦ ✦ ✦

PLANT cleanliness has a definite and vital part in accident prevention. Tools and miscellaneous materials such as scrap left on the floor around the machines are accident breeders. Trips, slips and falls at locations already hazardous are more prevalent when walk-ways are not kept clear. You must have noted how simple these situations we have discussed are to correct—yet it is from such conditions that most of our accidents arise.

Fig. 2. Republic Plants are active in various Safety competitions. Left—a trophy awarded for a first place in the Metals Section Safety Contest. Republic Plants will be presented seven such awards at the Annual Safety Congress in October. Right—plaque presented to a Republic Plant for winning the Inter-Company Contest. These contests do much to stimulate interest in Safety activities. ✦ ✦ ✦ ✦



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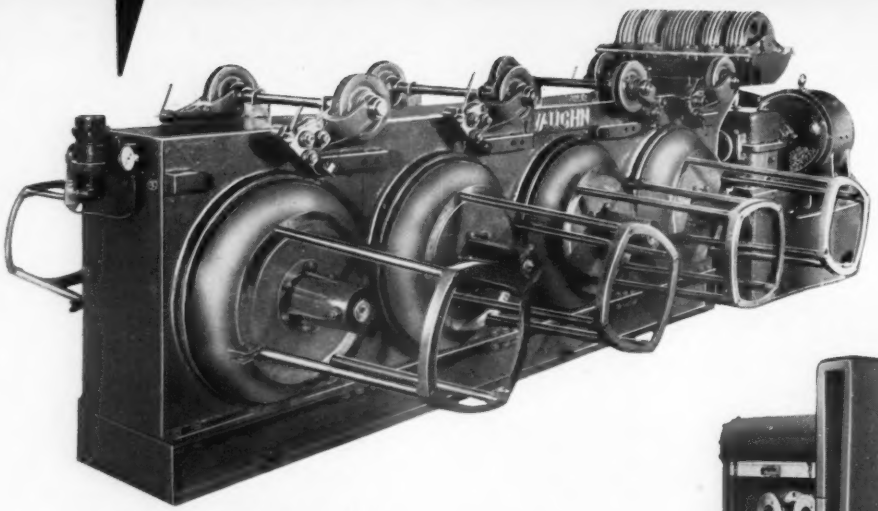

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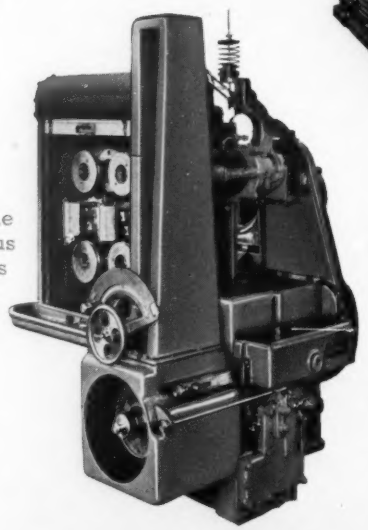
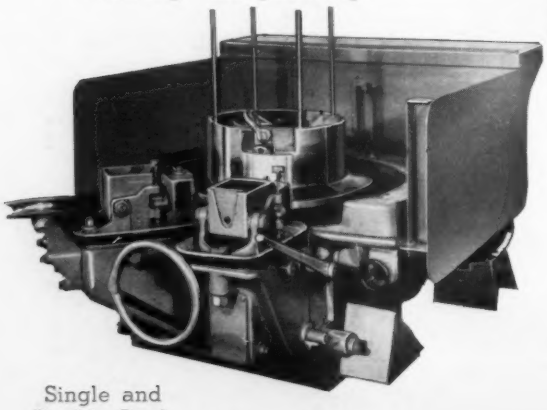
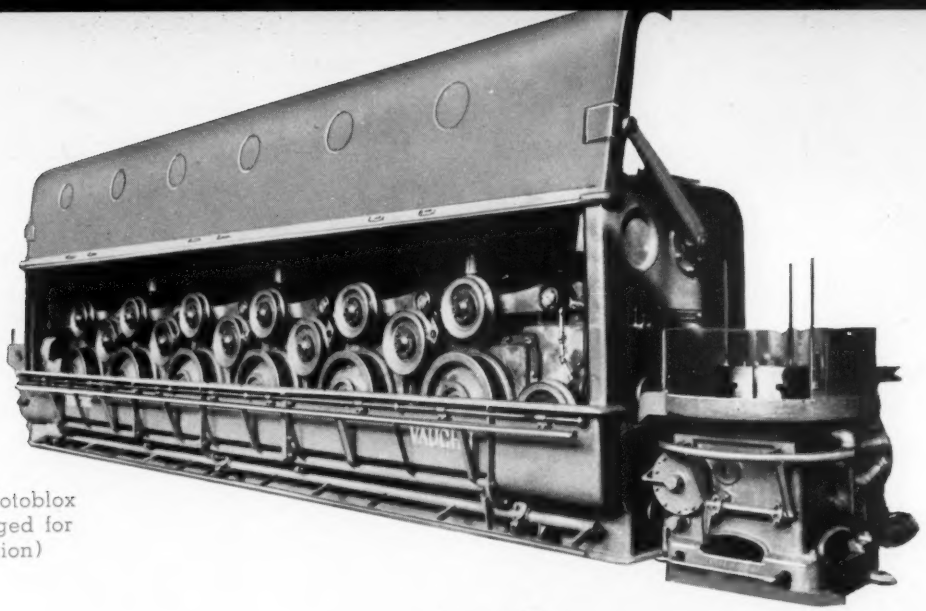


Four Cone Continuous Machines



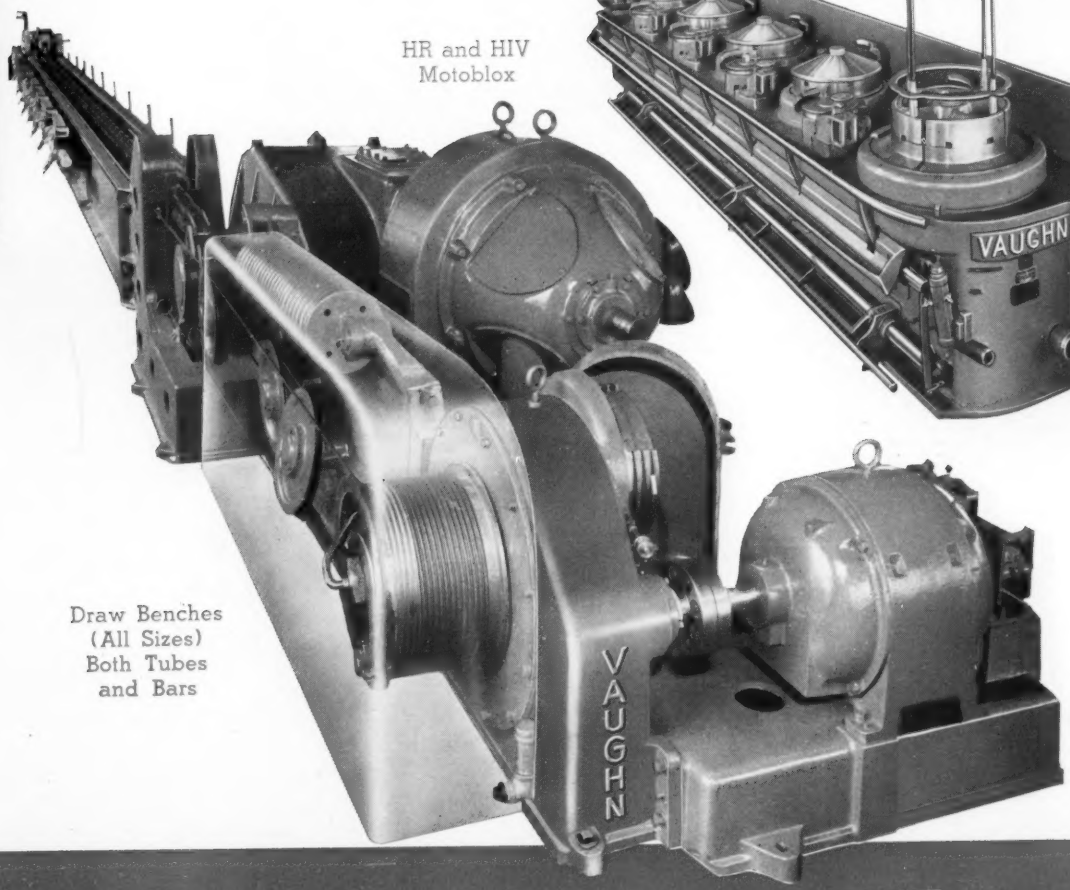
Single and Double Deck Motoblocs

AUXILIARY EQUIPMENT:
Pointers, Die Stringers, Strippers, Reels, etc.



HRH Motoblox
(Arranged for
solution)

HR and HIV
Motoblox



Draw Benches
(All Sizes)
Both Tubes
and Bars

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COMPLETE COLD DRAWING EQUIPMENT: Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

(1), (2), (5) and (6)—Official U. S. Navy Photos.

(3), (4), (7) and (8)—Photos by U. S. Army Signal Corps.

(9)—Official Photo, U. S. Army Air Forces.

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PICKLE or cleaning rooms present other serious problems somewhat similar to those in other parts of the plant. The principal difference is in the visibility. The handling of materials is about the same so the special dangers are in the handling and disposing of acids. When possible, the use of measuring tanks for acids is advisable, yet some years back we had the base of such a tank fail. The container turned over and crushed a man. Proper eye protection and protective clothing such as rubber boots and rubber aprons will prevent many burns from acids in these departments.

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A PROLIFIC source of accidents has always been found wherever men working on machinery fail to properly disconnect the source of power. To adjust equipment, to make repairs, etc., shut the machine down—and lock it out. Many a man has suffered a crushed hand, a mangled arm or even death when a machine started up without warning while he was working on it. The best way to prevent such accidents is to lock the machine out and have the man who works on the machine carry the keys. This type operation should be surrounded with every safety precaution.

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EXAMPLES of several of these accidents are interesting studies.

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Case No. 1

AN employee was setting up a turning machine to one and one-half inch size when he heard a chatter. He placed his left hand on top of the cover over the main spindle bearing and then started the machine to move the finishing head. The nut that holds the points in the finishing head struck the little finger on his left hand and crushed it. While he had his hand on the cover the little finger extended over the bearing and there was only about one-half inch clearance between the bearing and the nut.

Case No. 2

THE injured was operating a Vaughn wire block drawing one-fourth inch square wire. He stopped his machine after one-third of the coil was drawn and loosened his puller grip so that the wire would not pile up on the drum. He then started the drum and while it was in motion attempted to take the puller chain off the drum. The puller grip caught on the soap-box and his fingers were crushed between the puller chain and the block.

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Case No. 3

THE injured was operating a motor driven lathe. He stopped the machine and started to shift the belt with his right hand when he hit the control switch with his body, throwing it to the on position. Of course the machine started up and his right hand was caught between the belt and pulley twisting his arm.

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THE only positive way to do these jobs with safety is to lock out the machine before making the adjustments.

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Protective Equipment

PROTECTIVE equipment is of many types and varies for different types of operations but attention should be directed to certain fundamentals such as safety shoes, goggles and clothing that fits properly. The wearing of safety shoes, purchased locally or sold by the company, should be encouraged. These shoes today have proved essential and will prevent many foot injuries. Particular attention should be directed to the proper fitting of shoes, and you will find that this will eliminate many complaints.

Fig. 3. Projecting strands in cables, particularly at the splice, often lead to serious injury to the worker's hands. The splice in this case is safely covered with babbitt metal. ✦ ✦

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WHILE there are many types of eye protection available it is important that the hazard to which men are exposed be studied to select the proper equipment. In many instances close fitting cup-type goggles should be recommended—in other cases the spectacle type goggle with wire side screens will suffice. In all cases particular attention should be directed to fitting and adjusting the goggles to the individual. If this is done, and the manufacturers of the equipment will be glad to help you with this problem, most of the complaints on goggles will be eliminated.

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Safety Devices

SAFETY devices in the wire and wire products field are numerous and no attempt will be made to cover these, however, a few of these will be mentioned to present several ideas of just how such equipment may be effective. I take it that all of your draw benches and blocks are equipped with safety stops so we need not discuss them, but it is suggested that such safeties be checked at the start of each turn. If this is done you can be pretty sure that the device is functioning. It has long been our practice to equip the hooks of most over-head cranes with a safety latch. This is essential where a "stiff-leg" or an equalizer is used. The latch when in place prevents the hook on the spreader from disengaging when a lift is brought to rest. Many a man has been injured when the "stiff-leg" slipped off the hook and turned over on him.

MOST of your operations use scrap-ballers. On first glance this equipment is harmless but statistics indicate otherwise. On this job the controls should be so located as to prevent the possibility of a man being pulled into the baller, should he get tangled up with the scrap going in. "Dead-Man" controls are suggested — and this means that when the operator takes his hands from the control the baller stops. Particular attention should be given to the amount of drift the baller has and the clutch or other driving device should be inspected regularly. The machine should not only be in good condition at all times but the floors and plates around the equipment should be kept slip and trip proof. Of course, tight fitting clothing, leggings and goggles are essential on this work.

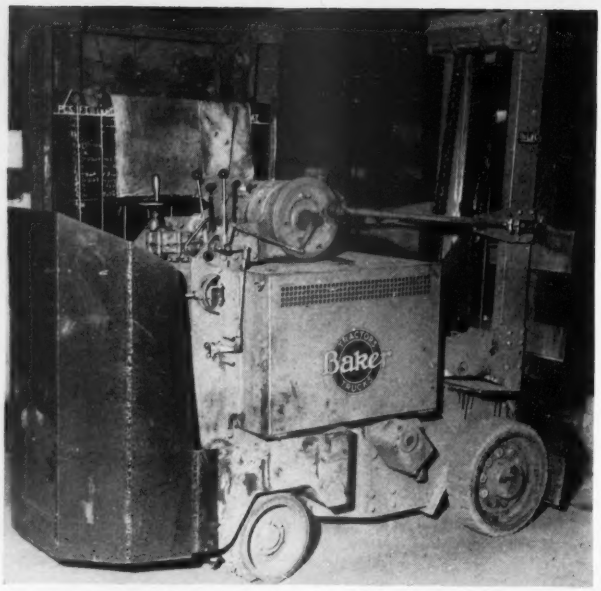

Fig. 4. Plant tractors, where men ride the end control platforms, should be provided with guards. Here is one type tractor equipped with a guard to provide protection for the operator's legs and back. ✦ ✦

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FLOORING, plates, etc., must be maintained also to make the operation of hand truck easier and of power trucks and tractors safer. Rules for tractor operators are essential. Speed limits, warning signals are an absolute necessity. Motor driven tractors are powerful equipment and mistakes in operator judgment or careless enforcement of safety rules often have serious results.

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OVERHEAD cranes likewise are a great source of danger if improperly operated. Here the cooperation between the man in the cab and the man on the ground can be a fine example of teamwork. So many factors enter into such safe operations that instruction and follow-up should be quite detailed. We have always stressed the importance of proper signals—from one man—and the full responsibility of the crane operator for the lift. As mentioned before we are always on the lookout for violations of instructions about keeping in the clear. Men know the dangers of getting in between a lift and the wall or the lift and a building column or other object, but the foreman must be continually on the watch to eliminate this practice.

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Reports

FROM an educational standpoint the use of the "Unsafe Practice Report" will be found most helpful. This report is used by the foreman to note and correct unsafe practices as he sees them on the job. The foreman corrects the unsafe practice at the time it is noted and explains the right practice and the "why it must be done this way" to the man. He then tells him the unsafe practice slip will be made out. These reports are used with other foremen to educate them in detecting unsafe working methods. This is a splendid check of foreman safety performance and if used properly, is a real tool for safety.

Fig. 5. Coke jacks are important for heating during cold weather. Guards should always be furnished for such equipment and here is shown one type of substantial guard which is simply fitted over the ordinary type coke jack. ✦

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WE have found repeatedly that the unsafe practice report plus the study of job hazards, in other words, job analysis, has helped a great deal in eliminating unsafe conditions and unsafe practices. In other words, if the foreman will study his job and figure out "what are the hazards facing my men on this job"—and then sets about to correct or eliminate or educate his men to these hazards and to good practice—by and large, accidents in such operations will be few.

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THIS discussion has, in general, given you some of the program followed by the **Republic Steel Corporation.** It is in no way our complete plan but we have found that the continuous program, carrying the safety work to the operation by every practical means known, will bring results. In these busy times, while the frequency and severity rates in most industries are soaring, the steady, long pull plan for safety brings results.

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THE real job for safety is done by the foreman and when he is sold and has analyzed his jobs for safety and carries this analysis to the job—real safety results are forthcoming and accidents are reduced. Thus we are able to keep men on the job turning out the war materials needed in a never ending flow by our armed forces.

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Submerged Combustion Takes Its Place in the War Industries

By Walter George See,
Sales & Service Manager,
Submerged Combustion Co. of America,
Hammond, Indiana

The results of three years' experience with the Submerged Combustion process for heating and agitating pickling solutions and the advantages obtained by users of the process are outlined. ✦ ✦

THREE years ago I had the honor of presenting a paper on Submerged Combustion heating equipment before this Association. Although Submerged Combustion for heating and agitating pickling solutions had been thoroughly tested and had successful applications in the field at that time, Wire men and the Steel Industry generally were inclined to think of Submerged Combustion as a "new Development."

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SINCE that time, Submerged Combustion has made a place for itself in the industry by the very simple method of living up to its claims of producing more pickled steel at a lower cost. Its list of users has increased materially; not only in the Wire Industry, but in the bar, plate, pipe, and shipbuilding fields. While the older installations are still plugging away faithfully . . . day in and day out . . . the newer ones are proving that the interesting cost and production figures made by early users were not isolated instances, but rather were indicative for the pickling field as a whole.

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TODAY, Submerged Combustion has taken its place in the War Industries. In plants where there was no room for pickle room expansion, these units have supplied the extra production from existing vats. War wise operating men who know the danger of over-expansion have found that these units can produce the needed tonnage now, and still give them the flexibility of operation and the minimum pickling costs which will be so vital in the re-adjustment period after the war.

IN order to refresh the memory of those who heard the first paper on Submerged Combustion, and to acquaint the others with the basic operating principles of these units, let me take a few minutes to run over the background and operation of these direct firing burners.

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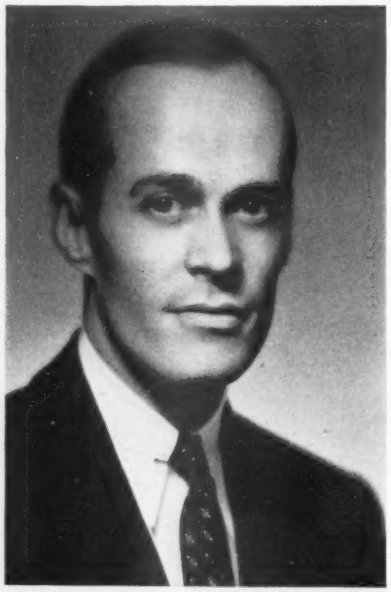
TWELVE years ago experiments were started on these submerged burners for pickle room use. It was realized that the burners must be simple in design, fully automatic as to ignition and control of temperature and, above all, to be rugged enough to withstand the treatment and corrosive conditions of the pickle room. As a result, all experimental work was done in a pickle room under actual working conditions. The results obtained from the first experimental burner were most encouraging and from that point on it was purely a matter of improvement and simplification. When placed on the market five years ago, the burner had a simple and reliable ignition system. The metal used in the burner could be guaranteed for one year in sulphuric or hydrochloric acid and had an expected service life of two years. Even then, the entire burner did not need to be replaced as the design permitted sectional replacement of that portion which was attacked most quickly, namely, the burner plate and bottom end of the burner tubes. This meant rapid and economical repair without the loss of production.



WALTER GEORGE SEE

Educated at Shady Side Academy, Pittsburgh, Pa., and the Carnegie Institute of Technology in Commercial Engineering. From there entered the employment of the LaSalle Steel Company in the Pickling Department and from 1934 to 1937 was engaged in development work on submerged combustion burners. From 1937 to the present time, engaged in development, installation, sales and service work as Sales and Service Manager of the Submerged Combustion Company of America.

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SIMPLY stated, this Submerged Combustion system consists of a control assembly designed so that the operator or watchman has only to press a starting button to put the entire unit in operation. Figure 1 is a cross section of the burner. Here you can see the ignition point, pilot flame and the main flame along with the controls. When the unit is shut down, the solution in the tank being heated seeks its own level, completely filling the combustion chamber and part of the burner manifold.

WHEN the starting button is pushed, an air compressor is started up. The compressor delivers the products of combustion at a pressure sufficient to overcome the head of liquid in the tank. As the compressed air is purging the burner of solution the control system beings to operate. Automatically a hot wire igniter is heated to incandescence by the passage of a high amperage low voltage current, and after a predetermined time a flow of pilot gas is admitted to the burner where it is ignited. The main gas flow is then permitted to pass into the burner where it is ignited by the pilot flame. The air-gas ratio is automatically controlled to give maximum combustion efficiency. The burner might be classed as a nozzle mixing type with no possibility of back firing.

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THE burner plate is located beneath the solution level to insure the cooling of the combustion chamber by the surrounding liquid. The tubular combustion chamber conducts the heat and products of combustion down to and across the bottom of the tub where they are vented and distributed to give the proper agitation.

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FOLLOWING the ignition of the main gas flame the burner controls lock themselves into a running position until the desired solution temperature is reached. The thermostat then acts to shut off the gas flow and thus stop the heat in-put. However, the control mechanism is so designed that the air continues to flow through the system to maintain a fixed rate of agitation regardless of solution temperature.

WHEN the thermostat registers a demand for heat, the controls recycle to automatically establish and ignite the gas flows. With the heat in-put so controlled, the solution temperatures can be maintained as close as one-half of one degree if necessary, but for pickling, the control range is usually set at 3 to 5° F.

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BURNERS are supplied in either single or double units. A single unit consists of a compressor, burner, and the necessary apparatus for ignition and control. Rated capacity of the single units range from 250,000 to 1,800,000 B.T.U. per hour.

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IN a double unit, two burners are connected to one compressor, the controls remaining essentially the same except that provision is made for additional ignition current, and the gas and air controls are arranged so that these flows can be adjusted for each burner.

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ALTHOUGH Submerged Combustion may be used to advantage in many types of solution heating, and is arousing much interest in the evaporation field for concentrating corrosive solutions, at present its greatest strides have been made in the heating and agitating of pickle liquors. It has long been known that the rate of scale removal from steel is greatly increased by agitation and aeration. Agitation may be accomplished by moving the work while in the solution, or better, by moving the solution about the work.

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WITH Submerged burners, the products of combustion are exhausted directly into the solution. This creates a terrific agitation and the pickling solution is agitated and moved about the vat at a rate which would be extremely difficult to achieve mechanically. As a result, the average pickling time on various grades of steel are reduced 40 to 70% of former practice if the operating temperature is held the same as it was with steam. The agitation also serves to keep the temperature extremely uniform throughout practically any size tank.

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IN general, the trend for pickling temperatures has been downward in recent years. The lower temperatures have much to offer where they can be used and still meet production demands. Pickling temperatures of 185 to 195° F. are expensive from many standpoints. Surface heat loss at 190 is almost twice that at 160. More heat is required to bring the steel up to this higher temperature and as more steam is used, there is more dilution from condensation. Besides these very concrete cost factors there is a much faster deterioration of handling equipment and building structure.

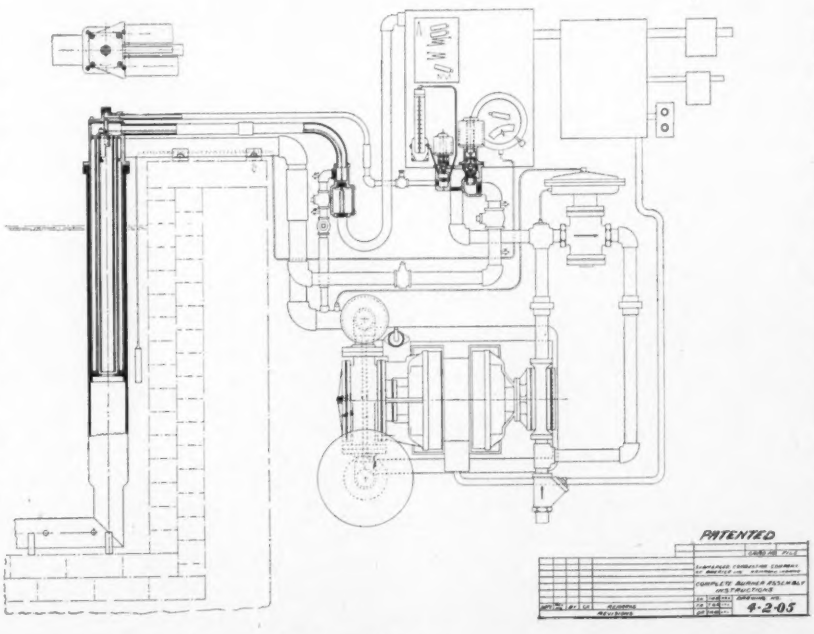

Fig. 1. Cross Section of Burner as it appears in the tank.

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THE reason why many plants use temperatures of 185 to 195 is that it is the only way they know to obtain the tonnage necessary to keep their machines supplied. However, the amount of tonnage obtained from a still tank heated with steam to 190° can be equaled or bettered by Submerged Combustion at 160°.

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FOR example, there is the case of a wire and rod pickling department in which it was necessary to crowd five yokes of coils into a vat designed to handle four yokes and to maintain a solution temperature of 190° in order to keep the machines supplied with pickled material. With the installation of Submerged Combustion, the temperature was dropped to 165° and only four yokes were pickled at a time. Not only did Submerged Combustion overcome this 25 degree drop in temperature and 20% load loss, but the new output ran 5 to 10% over what this tub formerly produced when steam heated. The superintendent of this plant has stated that he could produce even more tonnage if his handling equipment were adequate to service the tank as fast as it should be.

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ANOTHER user who first tried Submerged Combustion for bar pickling and later equipped his wire pickling set-up, reports that he has reduced his operating temperature in both departments from 185 degrees with steam to 155 degrees under his present set-up and has still obtained a 20% increase in spite of the temperature drop. In this case when further production is needed, he can obtain it without expansion by merely boosting his temperature to 165 or 170 as long as necessary to carry the load and then drop back down into the more economical heating range of 155 degrees. The benefits in reduced heating costs, maintenance, and operating conditions from these lower temperatures are obvious.

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HOWEVER, let us assume that a plant is already operating in the range of 155 to 170 degrees and wishes to continue at the same temperature. Let me quote one wire man who, after using Submerged Combustion in one tank for six months, ordered a second unit for his other tank. Quote—"We have had very good results with the first unit. The savings and increased efficiency in our cleaning line has been the deciding factor in our decision to install the second unit. The agitation loosens the scale more thoroughly and quickly and consequently requires less washing. Due to the great amount of agitation we are also able to clean more rods on each pin. The pickling time on basic rods has been reduced from approximately one hour to 20 to 30 minutes."—Unquote. Although this time figure may appear high, conditions and requirements vary from plant to plant and these figures are of value only as a comparison of what was done with steam as contrasted with the results achieved by direct firing.

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ANOTHER company in this category pickling wire rods showed an increase in pounds per man hour of 209% over steam the first year the burners were in operation.

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AS a rule, operating men are hesitant to release figures on their new equipment until they are sure that those figures represent a fair picture. This is understandable, and although complete figures are not yet available from some of the newer installations, indications are that similar reductions in pickling time is being achieved where the handling equipment is adequate and the bakers do not constitute a bottleneck.

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USERS of Submerged Combustion have found that they could switch from steam to gas fired Submerged burners even when the gas costs in their particular district were quite high. At present there are several installations running on propane. It is perfectly logical that the most economical place to generate heat is at the point of consumption, and that is just what Submerged Combustion does. It generates the heat right in the pickling solution. Further, it generates only the heat required by that solution at any given time. No heat is generated and allowed to die in long runs of steam pipe, or generated to heat the lines which carry it to the point of consumption. Nor is a direct fired vat dependent on a boiler house whose efficiency falls off rapidly at anything less than full boiler load. On the other hand, the combustion efficiency of Submerged Combustion is quite high. At 140 degrees it runs about 96%, at 160 degrees about 88%, and 170 degrees about 84%. Many plants use their boilers in the summer time for the sole purpose of supplying steam to the pickle room. In such plants, Submerged Combustion affords the opportunity to eliminate this extra charge and allow the complete shut down of the boiler house during those months that steam is not needed for heating the plant.

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STEAM costs and boiler efficiency probably vary more widely from plant to plant than any other single item of costs. However, as the following figures are comparative only, they serve the purpose of showing the economies to be gained by the use of direct firing burners.

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ONE user who pickles bar and rods formerly showed a steam cost of 45 cents per ton of steel pickled. Using gas which cost 75 cents per thousand cubic feet or 75 cents per million B.T.U.'s, his heating cost with Submerged Combustion is only 13.5 cents per ton. This is a direct savings of 31.5 cents per ton of steel pickled. Incidentally, this plant used steam only for pickling in the summer time and was able to shut down the boiler house all summer long.

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ANOTHER user doing pickling similar to that above pays 50 cents per million B.T.U.'s for his gas and has reduced his heating cost from 17.5 cents per ton with steam to 5.5 cents with Submerged Combustion, and this shows a savings of 12 cents per ton.

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STILL another user who pays 56.5 cents per million B.T.U.'s

reports a heating cost of 22.7 cents per hour for a tank holding four yokes of coils and having a surface area of 105 sq. ft. This vat contains 3000 gallons of solution at 165 degrees. Although no former steam costs were given for comparison, the approximate heating cost with the burners is 6.1 cents per ton.

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PROBABLY the most outstanding saving in heating cost has been made in a mill pickling racked sheet. This plant pays 20 cents per million B.T.U.'s for natural gas. Their steam cost per ton was 35 cents as compared with a heating cost of 1.5 cents per ton after installing Submerged Combustion, thus realizing a savings of 33.5 cents per ton. Incidentally, the production increase in this particular application was limited to about 87% because of crane service.

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ALONG with the production increase and lowered solution heating costs, there is a very definite saving in acid consumption. When live steam is used for solution heating, condensation results. Naturally the amount of this condensation depends on steam pressure at the pickle vat, its B.T.U. value there, and how dry it is. In any case, there is always some condensation and consequent dilution of the acid. In some plants this dilution may be so great that the solution level is raised to the point where some of the pickle liquor must be drained off to maintain the proper working level. A certain amount of acid is thus lost, and the weakened solution must be built up by the addition of new acid.

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WHEN Submerged burners are used, however, dilution is completely eliminated. In fact, the direct firing evaporates water and tends to concentrate the solution so that a small amount of water must be added to maintain the working level of the bath. In addition to the amount of acid thus saved, the terrific agitation causes a scrubbing action on the chemically loosened scale. This creates a further savings in acid which may total 25 to 50% of the acid added after the original bath is made up. In some plants this percentage may be bettered considerably.

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SOMETIMES it is hard to realize just how much money can be saved by careful control and consumption of acid. For example, one company had two leaky wooden bar tanks which they replaced with two new brick tanks. Their boiler set-up was inefficient, steam was replaced by Submerged Combustion in both the bar and wire tanks and immersion burners were used to heat the lime tanks. At the end of the first year of operation under the new set-up the figures were compared with those of a previous year in which the tonnage pickled was almost identical. The comparison showed that while $22,418 was spent for acid in 1937 only $10,145 was spent in 1939. Although it is hard to estimate just what part of this savings of $12,273 was due to the use of Submerged Combustion and what part was due to elimination of tank leakage, it does show that big money can be saved on acid alone.

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ANOTHER plant which uses Submerged Combustion in both bar and wire pickling reports a former acid consumption of 23.1 pounds per ton with steam as compared to 18.4 pounds per ton with direct firing burners. This savings of 4.7 pounds, or a little over 20% resulted strictly from the use of Submerged Combustion, as no other change in practice was made.

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ANOTHER user reports a savings of 140 pounds of acid per day from a small two yoke tank in which he pickles basic rods. He also adds that he is able to run his iron content 2% higher with Submerged Combustion before he has to dump his vat. In view of the acid problem in his locality, this is a very definite advantage to this user. In fact, these savings in acid and the ability to run the vat a little higher in iron content become more important as time goes on and munitions makers consume more acid. The most important factor in this respect, however, is the tightening of restrictions on spent acid disposal as more states pass stream pollution bills and sanitary districts and sewage disposal plants are set up. In most cases this means that the spent acid must be hauled away, or the acid neutralized or machinery set up for reclaiming it. In any case, the lower acid consumption effected by Submerged Combustion means less acid per ton of production which must be hauled away or otherwise processed. Further, due to the evaporative effect of the burners, the solution level can be allowed to drop before tub dumping time so that less spent liquor will have to be handled.

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THERE are very few departments in any plant as hard on equipment as the average pickle room. Let me stress that word "average." Although management has come to realize the importance of this department on such matters as costs, die life, and the quality of the ultimate finish, few plants have done anything about making it a clean dry place for either men or equipment to operate efficiently. By and large, there is not too much intelligence found among pickle room labor and as a result, equipment has to stand up under poor handling and little care as well as under severe corrosive conditions.

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QUITE often the question is asked "How does Submerged Combustion stand up under actual operating conditions." By way of answer to this question, let us take a look at several case histories of the older installations in plants other than that in which these burners were developed.

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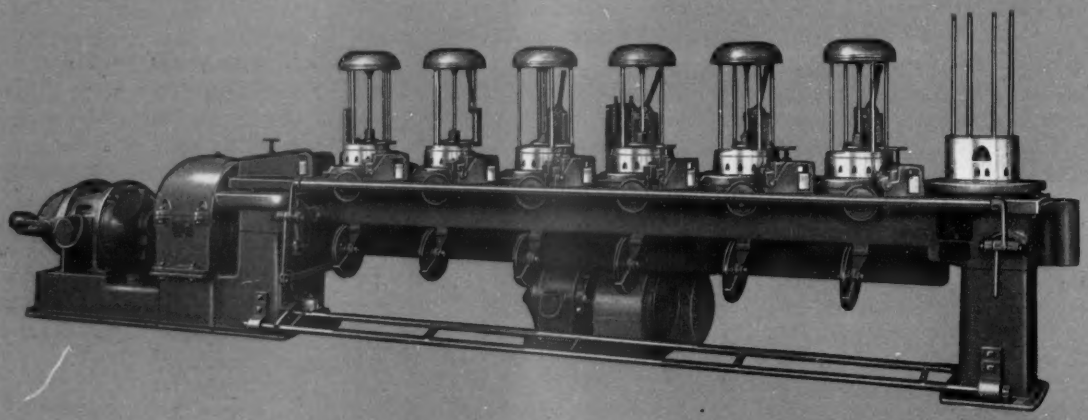
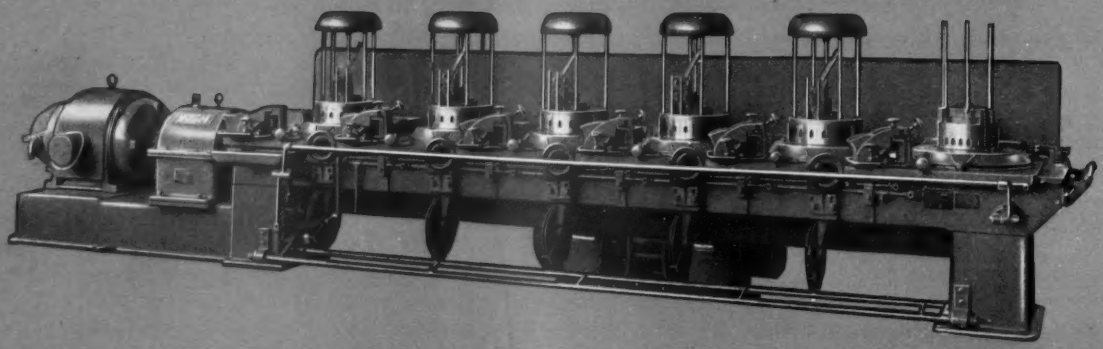
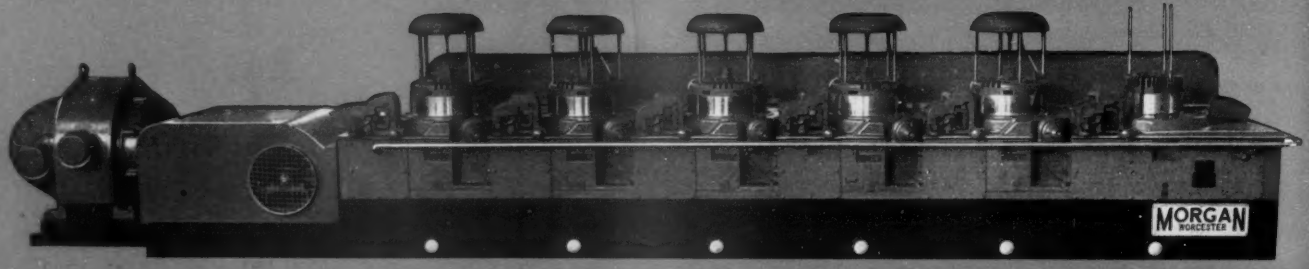
Case Study I

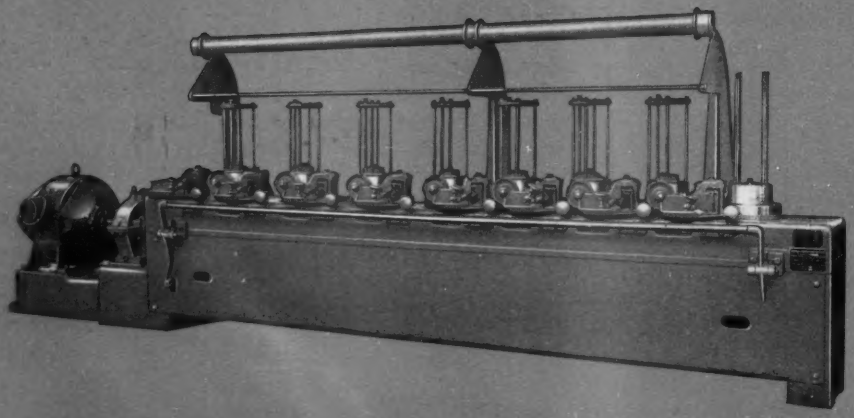
INSTALLATION date: December 15, 1937. This unit consisted of two burners of 750,000 B.T.U.'s each placed in a tank holding approximately 6000 gallons. By August of 1940, two years and eight months later, the bottom of the burners were corroded to the point where replace-

ARE THEY HELPING









Here are four typical Morgan-Connor Continuous Wire Drawing Machines. The high block design provides a time interval for the effective air cooling of the wire, thus permitting High Carbon as well as Low Carbon Wire to be drawn at maximum speeds.

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By Conserving Power. Efficiency here is also a matter of design: improved drives, less friction, less needless weight.

By Reducing Maintenance Costs. Morgan Wire Machinery is built with generous margins of safety to insure peak-load-operation with minimum time out.

* * *

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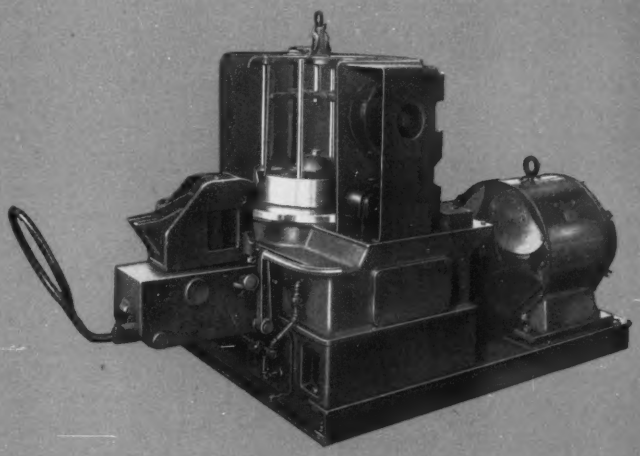
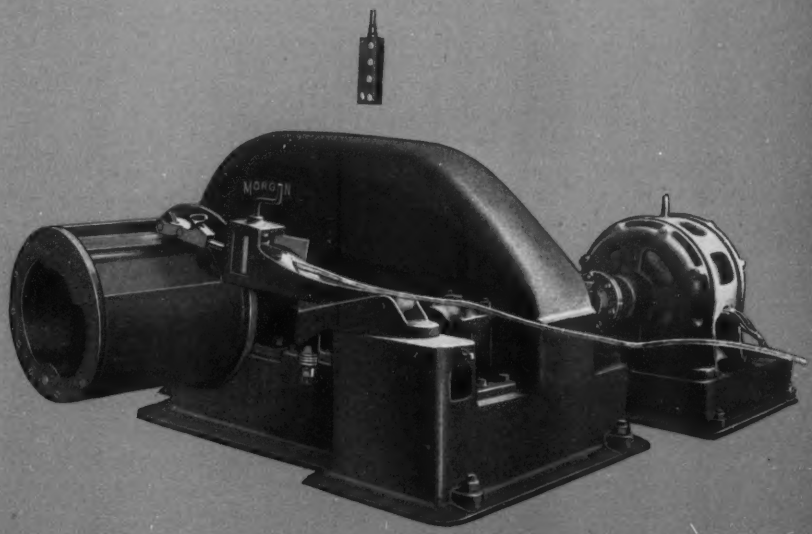


Morgan Vertical Spindle Wire Blocks offer important features: Single and double deck blocks; interchangeable blocks; die boxes fully adjustable for horizontal or vertical cast and equipped to receive all common sizes of die holders. Each machine is unit powered, and driven by combination spiral bevel and helical gears that give high efficiency at all ratios. Air-cooled blocks embody new patented fin-type construction which aids in dissipating heat. Modern safety devices.



Morgan Horizontal Bull Block, Type 105, handles cold drawn round stock one inch or less diameter and equivalent sections in other shapes. The outstanding feature is the speed with which a finished bundle can be stripped from the horizontal block. Smooth, quiet and dependable. High carbon steel gears with cut teeth run in a bath of oil. Shaft bearings are roller type throughout.

W-78

ments were necessary. About a year after this installation was made, a new burner was designed which was easier to ignite, had less critical flow settings, and would handle up to 1,800,000 B.T.U.'s per hour. Rather than repair the two smaller burners, a deal was made to replace them with one burner of the new design.

✦ ✦ ✦

DURING the two years and eight months that the two old burners were in service, replacements ordered consisted of a spare set of blades for the air compressor to be held in stock, two junction boxes, six igniters, two valves, a new set of brass petcocks, a spare seat and diaphragm for the gas regulator, and finally just before the changeover, six more igniters.

✦ ✦ ✦

DURING the two years since August 1940, three seats for the gas regulator and a spare burner plate have been ordered, making a total replacement cost of $211.50 for four years, plus the cost of switching burners. During the guarantee period a short developed across the main terminal of the ignition control and it was replaced.

✦ ✦ ✦

Case Study 2

INSTALLATION date: April 10, 1939. This also was a double unit consisting of two burners of 750,000 B.T.U.'s each. In August 1939, a burner unit similar to that used in pickling vats was adapted to immersion firing and installed for heating the lime bath. In January, 1941 another unit was installed when they revamped their wire pickling set-up. In the three years and six months of service for the double burner unit, one year and ten months for the single burner unit, and three years and two months for the immersion unit, needed replacements bought were 16 igniters, repairs to the ignition control due to corrosive fumes getting in the instrument box, some gaskets, and repairs to the ends of the two burners of the double unit. Total cost, $633.44.

✦ ✦ ✦

Case Study 3

INSTALLATION Date: August 5, 1940. This single unit is in service in a wire vat, and although it is located in a particularly corrosive atmosphere, it is running almost continually except for shut down when the tank is drained. Replacements for this unit in over two years has consisted of six feet of rubber hose, 2 igniters, 4 cap screws, and a new carbon horizontal run for the combustion chamber. Total cost of these replacements: $102.20.

✦ ✦ ✦

Case Study 4

INSTALLATION Date: March 17, 1941. This unit consists of a single burner and in its one year and 8 months of service has four igniters chalked up against it for a total of $24.00.

✦ ✦ ✦

Case Study 5

INSTALLATION Date: October 5, 1941. In the one year of service for this single unit, the only replacement necessary has been the repair of the temperature control bulb which was broken through carelessness. Charge: $10.00.

✦ ✦ ✦

OTHER case studies show pretty much the same story in connection with replacements. Some mills will run heavier than others simply because of difference in operating conditions, and whether the mechanical crew operates as maintenance men or a repair gang. Probably the most replaced item is the igniter. Normal expectancy is two to three months for this item which can be changed in about five to ten minutes. Many cases are recorded where the igniter has lasted eight months without being changed. Where conditions are favorable, a four to five month average is not unusual.

✦ ✦ ✦

AS is the case with all machinery, there is a certain amount of general maintenance to be done. Here, again, the amount will vary with working conditions within the vat, and the procedure of the individual shop. Periodically the gas and air lines should be broken at the hose connections and water flushed through the burner to remove any accumulation of ferrous salts and foreign matter which may have accumulated in the lines or behind the burner plate. Extreme cases may require this action every two or three weeks depending on the time down between shifts, the condition of the solution, and the gas used. In most cases, however, every two months is often enough, and we have one installation which was in operation eight months before it had to be cleaned out. As a matter of fact, quite a few users never touch these lines until such time as they begin to have trouble getting the full gas flow.

✦ ✦ ✦

THE life and maintenance of the combustion chamber is strictly a variable. With half reasonable care they will last for years and rarely require any maintenance. On the other hand, a careless pickler may flatten it out or bend it a week after it is put in. The chamber is usually placed so as to be as far out of the way as possible, but sometimes accidents will happen in spite of anything which can be done to prevent them.

✦ ✦ ✦

ANOTHER possible source of trouble for the combustion chamber may come from the iron content of the pickling solution. Where the acid is dumped before the iron content reaches about .65 pounds of iron per gallon, which is equivalent to approximately 28 Baume or 8% Fe., lead can be used for the combustion chamber. However, should the iron content be run above this point when lead is used, the ferrous salts will plate out on the lead, building up a coating perhaps one-thirty second thick. This coating insulates the lead sufficiently to cause it to burn out at the point where the salts are the heaviest. When the user wishes to run his iron content above .65 pounds of iron per gallon, a graphite chamber is used as this material is unaffected by the iron content.

✦ ✦ ✦

IN general, when the pickler is properly informed, and only a little common sense is used, very little trouble is experienced with the combustion chamber or any

(*Please turn to Page 619*)

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Electric Patenting of Wire

By John P. Zur,
Metallurgical Engineer
The Trauwood Engineering Company,
Cleveland, Ohio

This paper outlines the main points of importance in continuous strand patenting of wire and includes the effect of wire temperatures, quench temperatures, and time cycles on the physical properties and the drawing qualities of carbon steel wire. It also contains detailed material on continuous patenting by the electric direct resistance method and comparisons of physical and fatigue properties. ✦ ✦ ✦

THE patenting operation provides a means of varying the ultimate physical and fatigue properties of cold drawn steel wire over a wide range. Although there are a number of secondary factors such as the speed of drawing, distribution of drafts, and amount of reduction per draft which have a decided influence upon the properties of the finished wire, the patenting operation alone makes it possible to obtain the best combination of strength and ductility in the cold drawn, high carbon rope or spring wire.

✦ ✦ ✦

STEEL wire depends, in a great measure upon the presence of carbon for its strength and hardenability. Although carbon in the proper form and relationship with the other constituents is highly desirable in the drawn wire, it represents a problem in the rod. The carbon, or carbide (Fe_3C) in which form it is usually found in the structure before drawing must be dispersed or oriented in such a way as to render the mass uniformly ductile and capable of withstanding the severe operation of cold drawing. This is accomplished by the patenting procedure.

✦ ✦ ✦

THE patenting operation consists, essentially, of heating the wire to a temperature high enough for a long enough interval of time to insure complete solution and carbon diffusion and subsequently cool or quench it in air, molten salt, or lead. The operation is made continuous; the wire being drawn from pay off reels through the furnace, the quenching zone, and on to the haul off or takeup reels. In conventional practice heating is done in a fuel fired or electrically heated furnace or lead bath.

✦ ✦ ✦

THE principle objects of the patenting treatment are to give the steel a general normalizing treatment, that is, to remove the differences in structure which may exist from end to end of a coil of wire or rod; to improve the homogeneity of the material by inducing a uniformly sorbitic structure; and, as is the practice in the case of furnace patenting, to produce a large crystal size on the assumption that the larger grain tends toward more uniform flow in drafting. The usual patenting practice, where a furnace or high temperature lead bath is employed to heat the wire, fails to induce a structure which when drawn, brings out the optimium qualities of a steel.

JOHN P. ZUR

Graduated from Fenn College 1934. Bachelor of Science in Metallurgical Engineering. Employed at Cleveland Wire Spring Company 1934-1936. Engineer for The Trauwood Engineering Company 1936 to date. Member Wire Association.

✦ ✦ ✦

IN furnace patenting it is necessary to heat high enough and long enough to bring about as high a degree of chemical uniformity in the austenite as possible, and then quench fast enough from the maximum temperature so that the excess ferrite, in the case of hypoeutectoid steels, does not have time enough to migrate to the grain boundaries. Of a necessity, there is an appreciable space separating the furnace or heating bath from the quench, and the wire is subjected to an interval of air cooling before it enters the quench bath. Figure 1 illustrates this condition insofar as its effect on the transformation products is concerned. It can be seen that this air cooling interval materially reduces the quenching speed to the transformation temperature, and brings about a condition where the proeutectoid constituent ferrite is rejected during the cooling cycle. Structures of medium carbon steels conventionally patented in the smaller gauges show less precipitation of free ferrite since the rate of cooling is faster than the heavier sizes and the hardness and tensile strength of these smaller sizes are higher than those of the patented heavier gauges. Air patented structures are usually found to contain more ferrite precipitation than the lead or salt quenched structures. The presence of free ferrite in patented microstructures is undesirable in that although the ferrite is a relatively soft constitu-

ent, and is easily cold worked up to a certain point, it loses its ductility rapidly when cold worked.

✦ ✦ ✦

FIGURE 2, at 2000 diameters magnification, shows a typical air patented structure. The proeutectoid ferrite is readily discernible and there is a preponderance of lamellar pearlite. The structure is relatively coarse.

✦ ✦ ✦

FIGURE 3 illustrates a typical double lead patented structure, at the same magnification. Although the size of the grain is considerably finer, free ferrite and lamellar pearlite are also present in well defined areas.

✦ ✦ ✦

THE rate of cooling in patenting operations is very important as the resulting structure is dependent on the speed of cooling and the temperature at which the transformation took place. Slow cooling from the patenting temperature will result in a coarse pearlitic structure. The presence of lamellar pearlite in the patented structure is to be avoided, for when this type of structure is subjected to cold working, the flow or slip must take place in the direction of the lamellae, and in many of the grains the direction of the lamellae is opposed to the general flow which tends toward irregularity of movement, and fracture will result after a material reduction in drawing. Although the pearlite is softer than the sorbite, the ductility desired in the patented state is not in the sense of ease in drawing, but rather the greatest capacity for uniform cold flow.

✦ ✦ ✦

THE size of the grain in the patented structure is dependent almost entirely upon the furnace or wire temperature and is almost independent of the quench bath temperature and speed of cooling. In furnace or lead pot heating practices there is a definite limit to the heating rate which can be obtained. The slower rate of heating through the critical range will result in the coarser austenitic grain size.

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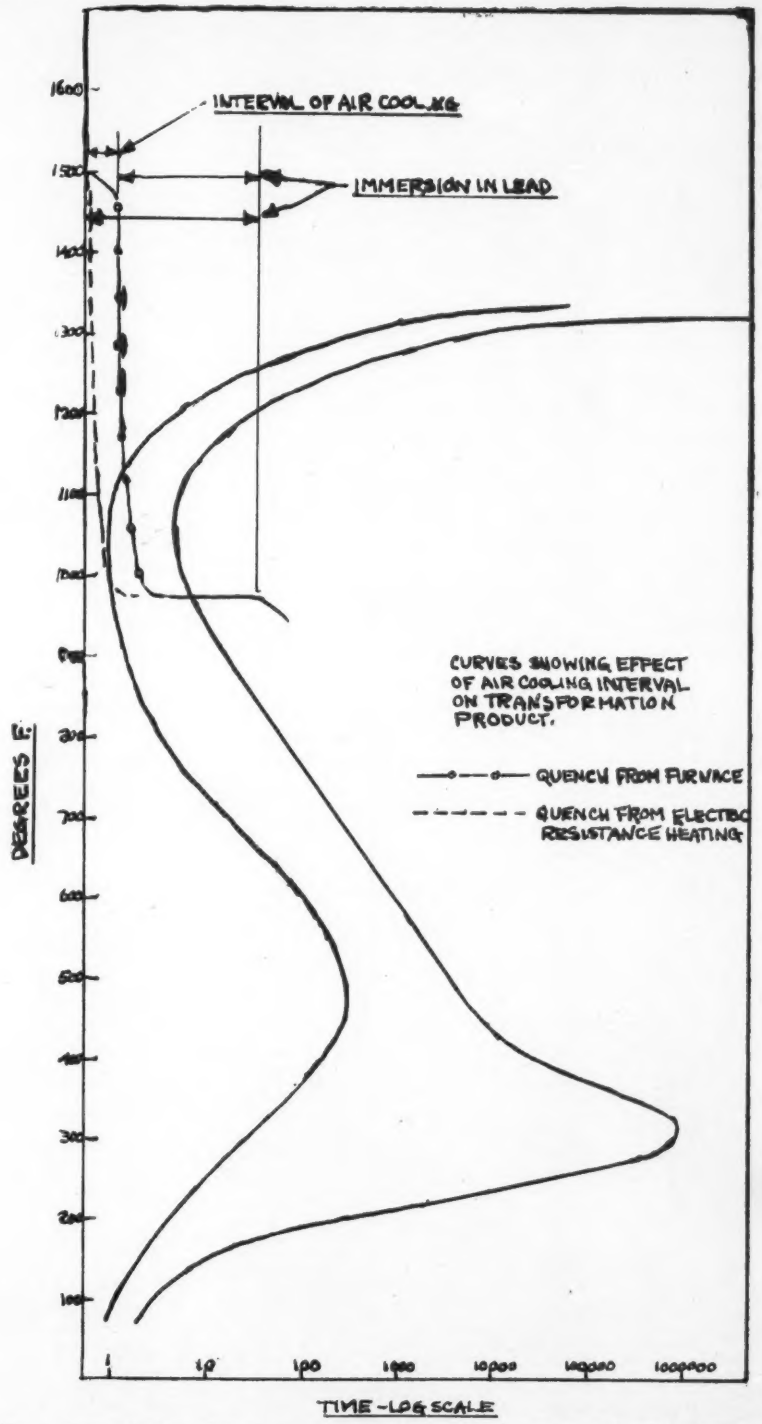
INTERVAL OF AIR COOLING
IMMERSION IN LEAD
CURVES SHOWING EFFECT OF AIR COOLING INTERVAL ON TRANSFORMATION PRODUCT.
QUENCH FROM FURNACE
QUENCH FROM ELECTRIC RESISTANCE HEATING
DEGREES F.
TIME - LOG SCALE

Fig. 1. Curves showing effect of air cooling interval on transformation product in patenting operations.

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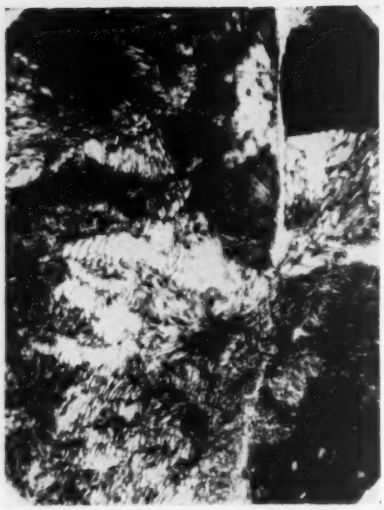

Fig. 2. Furnace heated and salt quenched structure of .67 carbon steel rope wire. 2% Nital etch. X2000.

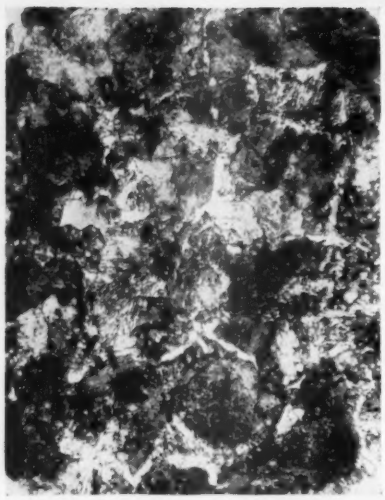

Fig. 3. Double lead patented structure of .67% carbon steel wire. 2% Nital etch. X2000.

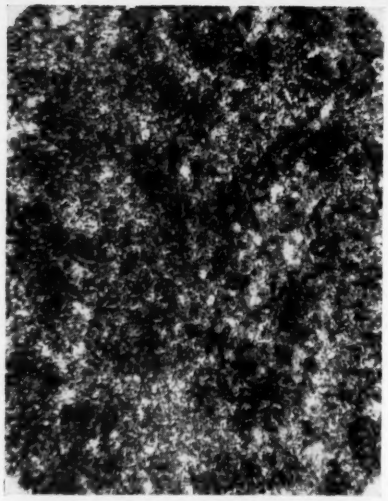

Fig. 4. Electrically patented structure of .67 carbon steel wire. 2% Nital etch. X2000.

THE argument on the point that the coarser grained structure produced in conventional patenting practice by quenching from higher temperatures is a better structure than the finer grained structure obtained by quenching from the lower temperatures is very misleading. The assumption is that the larger grain tends toward more uniform flow in drawing and that the finer grain will be overdrawn after a material reduction is obtained. Previous investigators have shown that when a hypoeutectoid (below .85 carbon) solid solution cools at a given rate, the precipitation of ferrite is dependent on the maximum temperature from which cooling started. Since the ferrite deposits at the grain boundaries of the austenite, the larger the initial austenitic grains, the less ferrite will deposit at a given cooling rate. The uniformity of the resulting structure will therefore increase with the higher temperature and a longer heating. This is the explanation given for the value of the high temperatures used in furnace patenting procedures, the object being not to produce a coarse

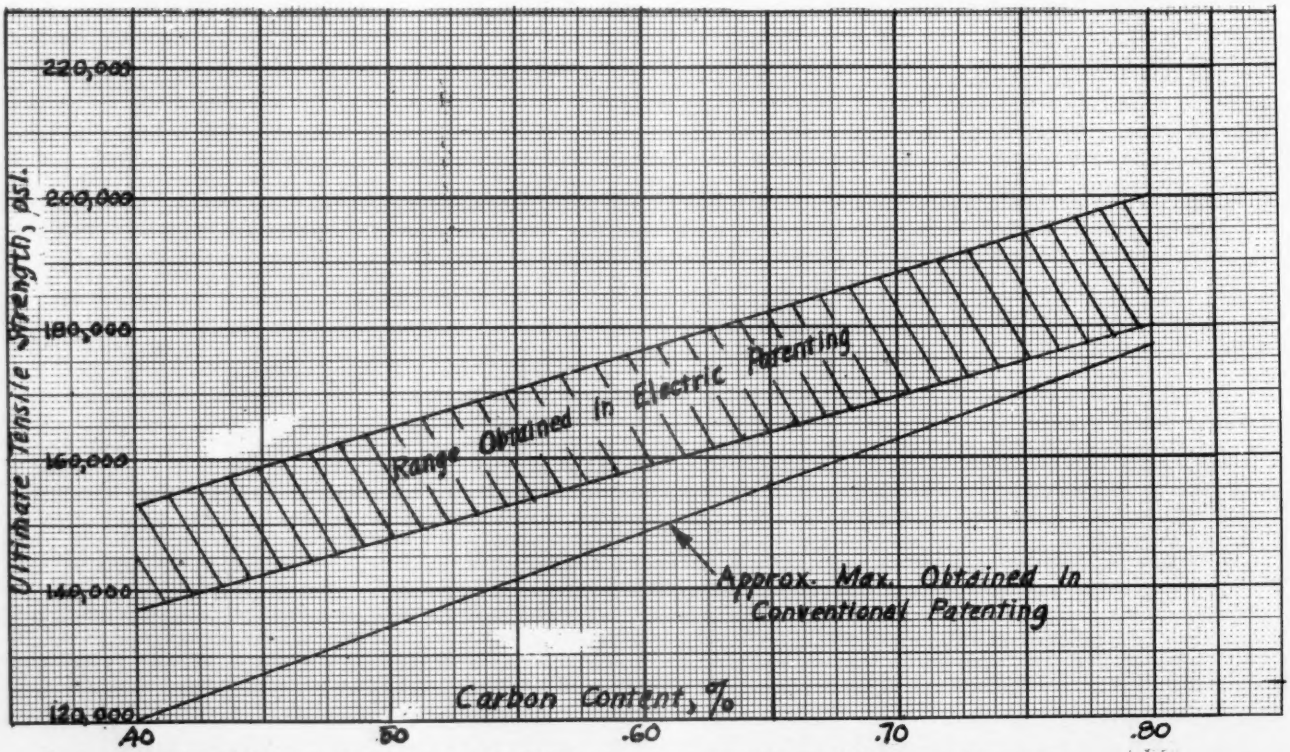

Fig. 5. A comparison of the tensile strengths of rope wire furnace patented and patented by the electric direct resistance method.

grained product, but rather to secure a more homogeneous structure with a minimum of free ferrite.

✦ ✦ ✦

FIGURE 4, at 2000 diameters magnification shows the structure of the same steel (.67% carbon) which was patented electrically. There is a minimum of free ferrite present and the carbide is well dispersed throughout the structure.

✦ ✦ ✦

A MORE rapid quench is obtained in electric resistance patenting because of the fact that quenching begins as soon as the wire reaches its maximum temperature. The temperature of the wire increases right up to the point where it enters the quench bath. There is not the interval of air cooling on account of the space, separating the furnace or heating bath from the quench as is found in conventional patenting treatment.

✦ ✦ ✦

THE electric direct resistance patenting treatment differs from usual patenting practice only in the method of heating employed. Instead of using a furnace or high temperature lead bath, the wire is heated by means of passing an electric current directly through it and subsequently quenched in molten lead maintained at the required temperature. The heating is uniform throughout the cross section and a much faster rate of heating is possible. In addition, the heating and cooling rates are very flexible, and can be easily adapted to any conditions necessary to obtain the desired results. The wire attains the maximum temperature in a few seconds since the heating rate is independent of the thermal conductivity of the steel, furnace temperature, etc. and consequently far greater wire speeds than those used in ordinary procedures are possible.

✦ ✦ ✦

IN the patented condition the wire electrically treated is somewhat harder and possesses a higher tensile strength than the same material furnace patented. Figure 5, gives a comparison of the tensile strength of rope wires furnace patented, and electrically pat-

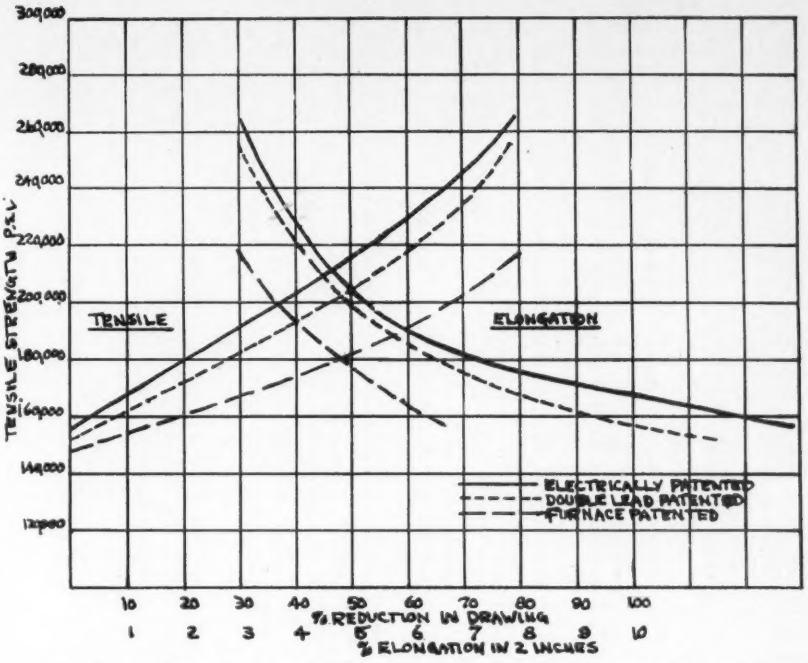

Fig. 6. Effect of cold drawing on the tensile strength and elongation of conventionally patented and electrically patented .65 carbon steel wire.

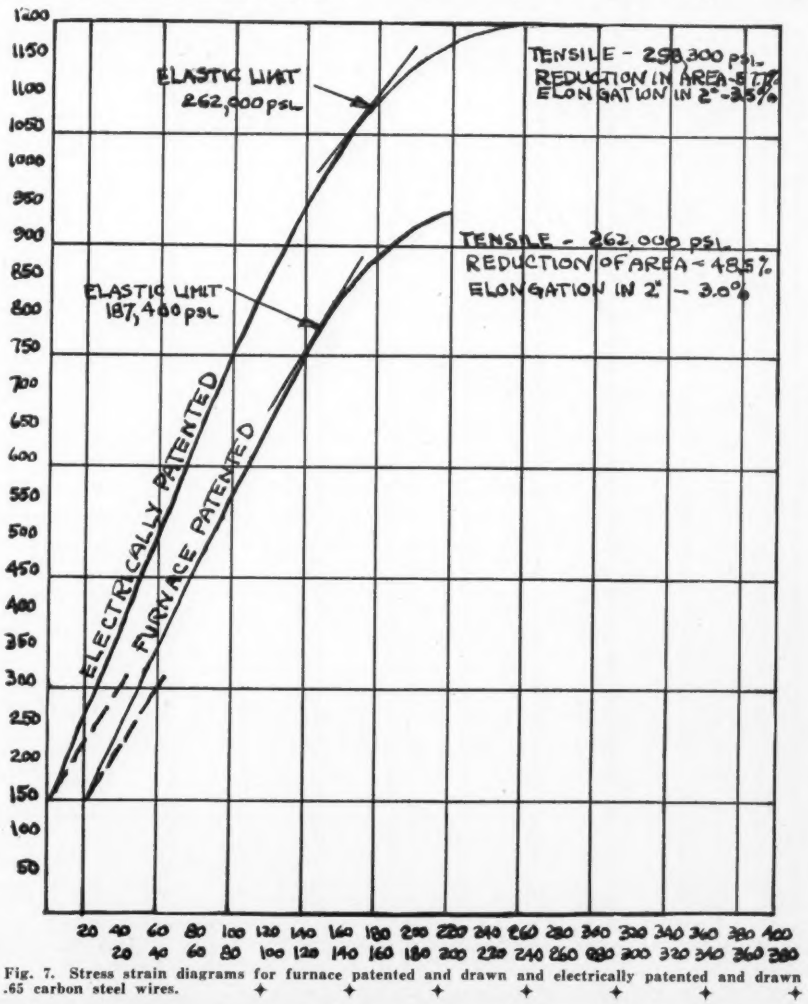

Fig. 7. Stress strain diagrams for furnace patented and drawn and electrically patented and drawn .65 carbon steel wires.

ented. This higher tensile strength may be attributed to the fact that the electrically patented stock is more sorbitic, that is, the carbide is dispersed throughout the structure in the form of extremely thin plates, not discernible even at magnifications of 2000 to 3000 diameters, and in the case of poeutectoid steels there is practically no free ferrite present. These points are evident from a comparison of the micro-photographs shown in figures 2, 3 and 4. Nevertheless, although the electrically patented structure is harder, at the same time it is more ductile, from the standpoint of its reaction to the cold flow in drafting.

✦ ✦ ✦

FROM an examination of the curves shown in figure 6, comparing the tensile strength and elongation of both electrically patented and conventionally patented and drawn .65 carbon steel wire, it is evident that a higher tensile and better elongation can be obtained from the drafting of the electrically patented wire. In practical application it is possible to eliminate one or two holes in drawing to obtain a desired tensile in a given reduction. There is a marked difference in the elastic limits of carbon steel wires drawn from furnace patented and electrically patented stock. The curves shown in figure 7 compare the tensile strength and elastic limit (Johnsons) of furnace patented and drawn, and electrically patented and drawn wires.

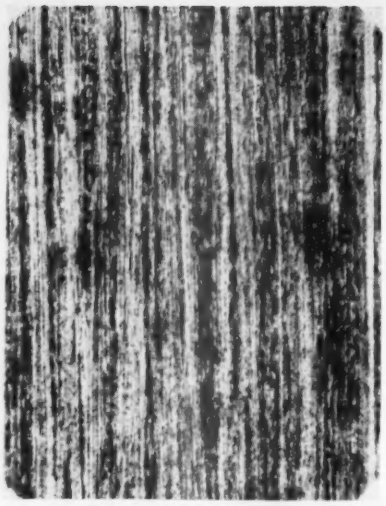

Fig. 8. Electrically patented and drawn .65 carbon steel wire. 2% Nital etch. X2000. ✦

✦ ✦ ✦

FIGURE 8 at 2000 diameters magnification shows the structure of .65 carbon steel wire which has been drawn approximately 96% reduction from electrically patented stock. As will be noted, the micro structure possesses a short fibre whereas wire drawn from conventionally patented stock has a long fibre. This of course is due to the differences in grain size produced by the two methods of patenting.

✦ ✦ ✦

THE opinion of many investigators is that the short fibred

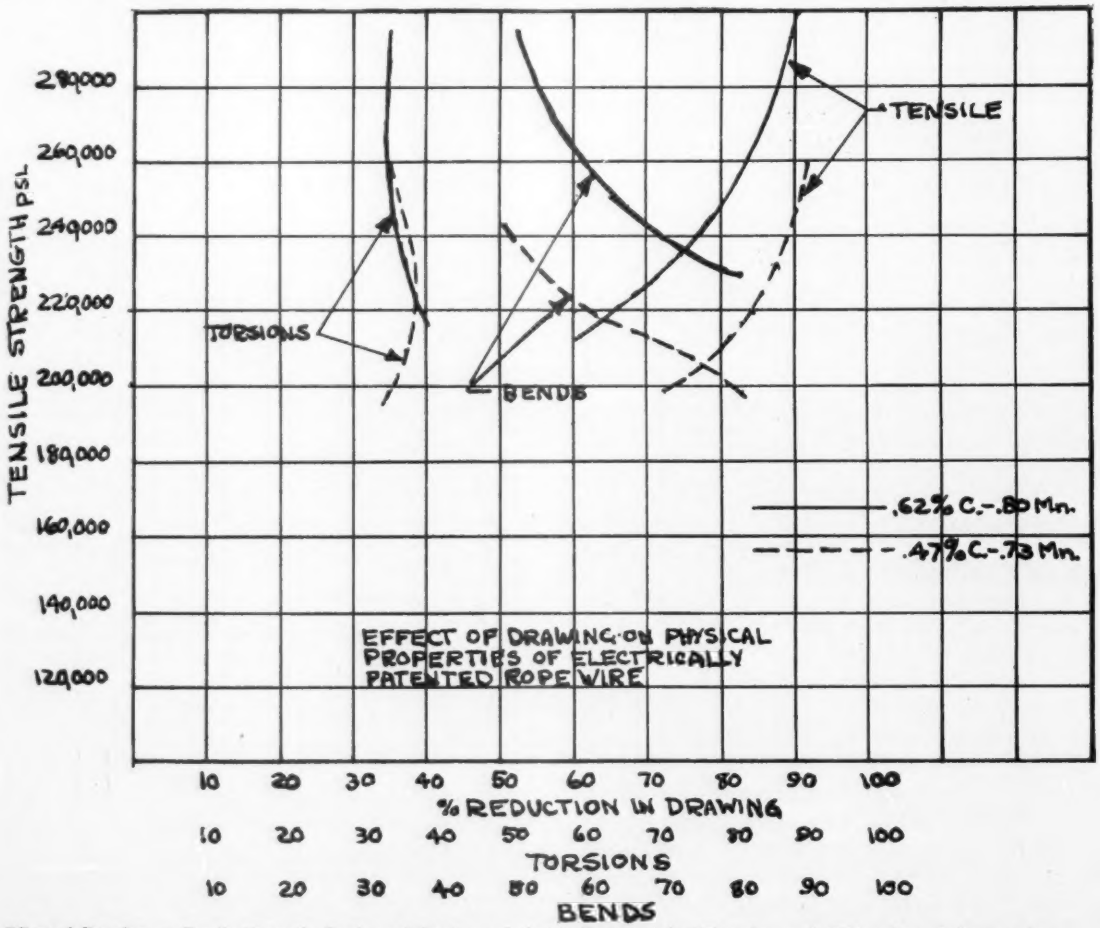

Fig. 9. Effect of Drawing on Tensile Strength, Bends, and Torsions of electrically patented .47% carbon and .62% carbon steel rope wire. ✦

wire such as produced by the drawing of electrically patented stock would have considerable lower torsional properties than the long fibred wire produced by the drawing of furnace patented wire. However, although there is a marked difference in the length of fibres in wire drawn from stock patented by the two methods, no such great difference in torsional properties has been found to exist between them. In this connection it may be pointed out that the range of torsion values obtained from electrically patented and drawn wire is narrower than that of furnace patented wire.

THE curve shown in Figure 9 illustrates the effect of drawing on the tensile strength, torsion and bends of .47 carbon and .62 carbon rope wire, patented by the electric direct resistance method.

✦ ✦ ✦

BOTH the .47% carbon and .62% carbon wire was drawn green to .135" diameter and air patented in a 50 foot furnace at 23.4 ft. per minute, using a furnace temperature of 1800°F. The two lots were drawn two drafts to .100" diameter and subsequently electrically patented at a speed of 68 ft. per minute using a wire temperature of 1650°F, and a lead quenched to 980°F. The table Figure 10 shows the physical properties of the material after electric patenting.

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THE electrically patented material was drawn to convenient rope wire sizes as shown in the table, Figure 11. The torsions were taken in 100 diameters and the bends in terms of 90° bends over .330" radius mandrel for the .053" diameter, .270" for the .045" diameter, and .210" for the .039" diameter and the .032" diameter.

✦ ✦ ✦

AN investigation made a comparison of the physical properties of rope wire cold drawn from stock patented by the electric

FIGURE 10

TABLE SHOWING THE PHYSICAL PROPERTIES OF ELECTRICALLY PATENTED .100" DIAMETER ROPE WIRE

Analysis	Tensile Strength	% Elongation	% Reduction in Area
.47 Carbon	128,575	14.0	66.75
.62 Carbon	155,200	12.7	61.0

FIGURE 11

TABLE SHOWING THE DRAWING PRACTICE USED ON THE .47 CARBON AND .62 CARBON STEEL ROPE WIRE

Finished Wire Size	No. of Drafts	% Red./Draft	Total Reduction
.053" Diameter	4	27.2%	72.0
.045" "	5	27.2%	80.0
.039" "	6	5@27.2% + 25%	84.8
.032" "	7	5@27.2% + 25% + 30%	89.4

FIGURE 12

COMPARISON OF PHYSICAL PROPERTIES OF ELECTRICALLY PATENTED AND FURNACE PATENTED ROPE WIRES

Sample No.	Size	Elastic Limit (Johnson's) P. S. I	Yield Point (.2% Method) P. S. I.	Tensile Strength P. S. I.	% Elong. in 2 inches	% Red. Area	Rockwell C Filed Surface
			Furnace Patented				
1-M	.127	65,200	93,500	146,200	10.0	33.0	31-32.5
	.127	68,400	89,100	146,200	9.0	29.2	31-34
2-M	.153	67,000	86,000	146,000	10.0	40.5	31.5-33
	.153	66,300	85,900	146,500	11.0	37.7	33-34
			Patented by the Electric Direct Resistance Method				
1	.1285	121,500	128,000	164,500	10.0	56.4	36.38
	.1285	122,000	126,000	164,000	9.0	54.5	37.38
2	.1555	125,200	129,000	171,000	13.5	62.5	37-38
	.1555	124,000	131,000	171,000	14.0	62.5	37

direct resistance method, and by the conventional gas fired furnace, using a molten salt quench.

✦ ✦ ✦

IN the case of the electric patenting treatment, both the .67% carbon and the .81% carbon steel wire was heated to 1700°F by resistance heating and quenched in a lead bath maintained at 950°F. As a comparison both analyses were furnace patented, using a furnace temperature of 1780°F and a salt quench maintained at 980°F. The table in Figure 12 compares the physical properties of both the electrically patented and furnace patented wires. Both lots of the .128" diameter, .67% carbon wire were drawn 5 drafts to a nominal finish diameter of .0485". This represented a total reduction in cross sectional area of 85.8%. The two lots of .158" diameter, 81% carbon wire were drawn 5 drafts to a nominal finish diameter of .0675", a total reduction in cross sectional area of 81.8%.

✦ ✦ ✦

THE analysis of samples 1, 2, 1-M, and 2-M, is given in the table Figure 13. The .67% carbon steel wire had an A.S.T.M. Grain Size as determined from a sample of the hot rolled rod of No. 2 to No. 4. The 81% carbon steel wire had a grain size of No. 3 to No. 4.

✦ ✦ ✦

THE physical properties of both the .0485" diameter and the .0675" diameter wires are shown in table, Figure 14.

✦ ✦ ✦

THE following is a discussion of the results obtained in this investigation:

Pickling

BOTH the .81 carbon and the .67 carbon wire pickled in a 4% to 5% by weight solution of sulphuric acid, with an inhibitor added. The electrically patented wire required approximately half the pickling time given the furnace patented wire. After cleaning, the surface of the electrically treated wire was smoother and brighter than that of the furnace patented wire.

✦ ✦ ✦

Tensile Properties

FROM the results obtained it was very apparent that a higher tensile could be obtained from a given steel and a given drawing practice by electric patenting.

✦ ✦ ✦

IN the case of both the .81 carbon and the .67 carbon wire electrically patented and drawn, the elongation in 10 inches was higher than that of the wire drawn from the furnace patented stock. It was interesting to note, that the range of values obtained from the electrically patented and drawn wire was the narrower.

Torsional Properties

IN the case of both the .81 carbon and the .67 carbon wire electrically patented and drawn, the average number of torsions was somewhat lower than those of the furnace patented and drawn stock, however, the range of torsions for both analysis electrically treated wire was narrower. The torsions of the electrically patented and drawn wires were higher than the minimum requirements for improved plow grade steel rope wire.

✦ ✦ ✦

Bending Properties

THE bending properties of the electrically patented and drawn and the furnace patented and drawn wires were practically identical. The range in the number of bends was narrower and the average number of bends was greater for both electrically patented wires when bent over the larger radius mandrel.

✦ ✦ ✦

Fatigue Properties

THE curve shown in figure 15 shows the endurance properties of both the .81 carbon and the .67 carbon wires patented by the two methods. The machine used to make these tests was of the reversed flexure, constant strain type. From an examination of

FIGURE 13

Average Chemical Analysis of Wire

Sample No.	%C	%Mn	%P	%S	%Si
1 and 1M	.67	.75	.016	.024	.17
2 and 2M	.81	.78	.019	.028	

FIGURE 14

COMPARISON OF PHYSICAL PROPERTIES OF ROPE WIRE PATENTED BY TWO DIFFERENT METHODS AND DRAWN

Wire Size	% Carbon	Type Patenting	Actual % Red. in Drawing	P. S. I. Tensile	Average % Elong.	Bends	Torsions
.0485"	.67	Furnace	85.4	257,000	1.56	38 -49	41 -46
.0485"	.67	Electric	85.9	287,500	1.6	41 -49	40.5-42
.0675"	.81	Furnace	81.2	241,000	2.1	36 -46	36.5-51
.0675"	.81	Electric	81.9	275,000	2.45	41.25-43.8	30 -38

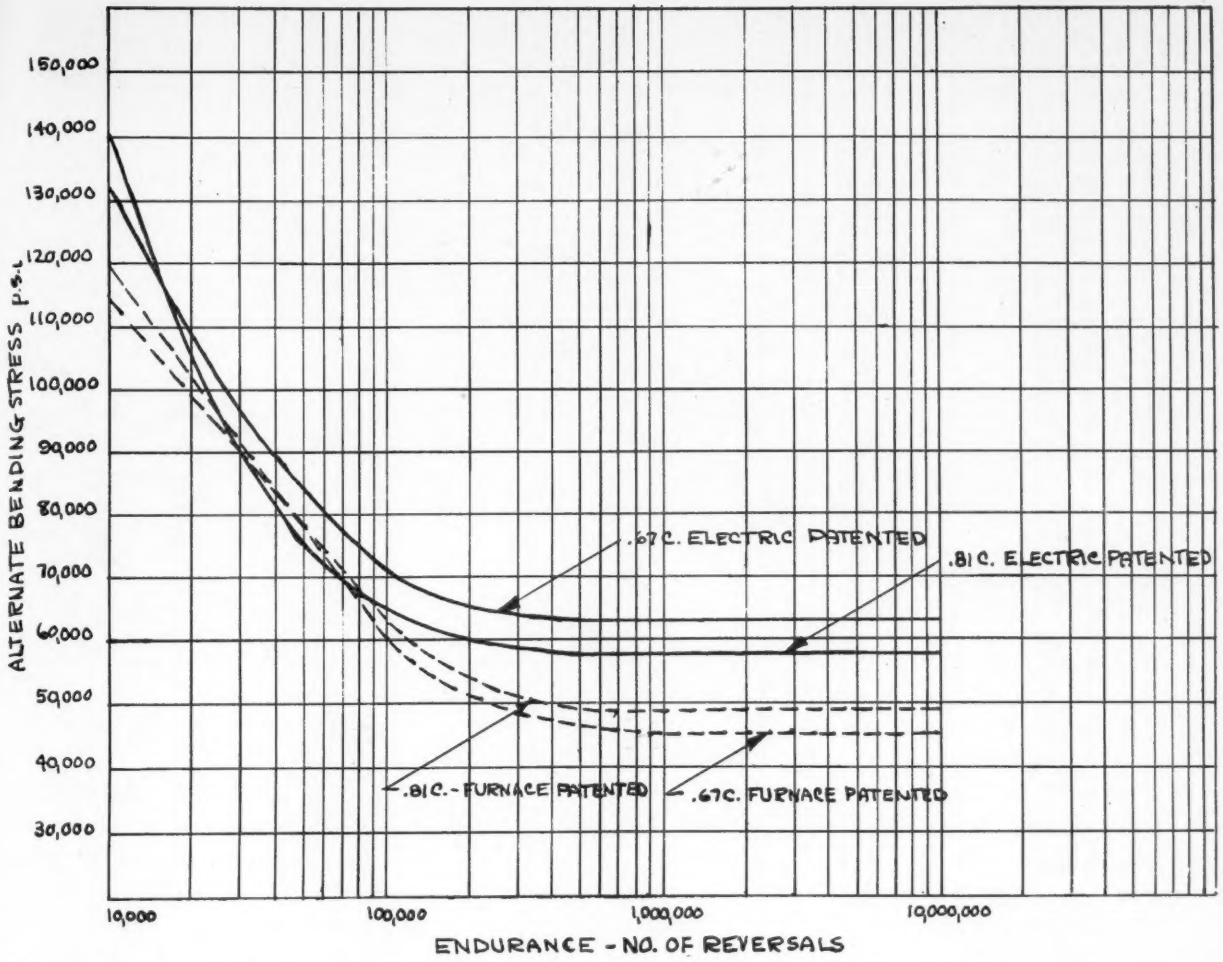

Fig. 15. Curves comparing fatigue properties of electrically patented and drawn and furnace patented and drawn rope wires.

✦ ✦ ✦

this curve, it can be seen that the fatigue limit of both the .81 carbon, and the .67 carbon wires electrically patented and drawn was higher than the same material furnace patented and drawn. The endurance properties of the electrically patented wires were also better at stresses above the fatigue limit.

THE table given in Figure 16 compares the ratio of the fatigue limit to ultimate tensile strength of the wires tested. The value for the .67% carbon electrically patented and drawn wire is considerably higher than that for the same analysis furnace patented and drawn. In the case of the .81% carbon wire, the ratio is slightly higher for the electrically patented and drawn stock.

✦ ✦ ✦

A MICROSCOPIC examination of the furnace patented wire at 200 diameters showed signs of appreciable surface decarburization. Figure 17 illustrates this condition. There was practically no decarburization of the surface

FIGURE 16

COMPARISON OF FATIGUE PROPERTIES OF WIRE DRAWN FROM STOCK PATENTED BY DIFFERENT METHODS

Wire Designation	Ratio of Fatigue Limit To Ultimate Tensile Strength
0.0485" Dia. Wire—0.67% Carbon Steel—Drawn From Stock Patented by the Electric Direct Resistance Method	0.219
0.0485" Dia. Wire—0.67% Carbon Steel—Drawn From Stock Patented by the Conventional Method	0.175
0.0675" Dia. Wire—0.81% Carbon Steel—Drawn From Stock Patented by the Electric Direct Resistance Method	0.207
0.0675" Dia. Wire—0.81% Carbon Steel—Drawn From Stock Patented by the Conventional Method	0.203

in the case of the electrically patented wire. An interesting point in this connection is the fact that the electrically patented wire is

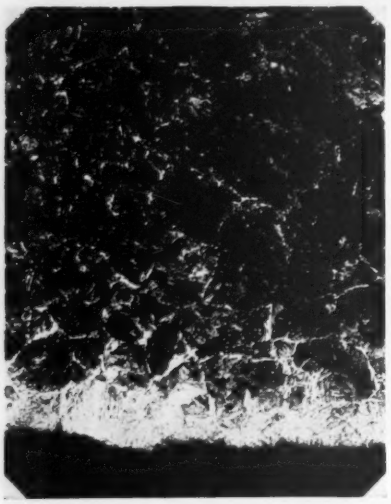

Fig. 17. Decarburized surface of furnace patented wire. 2% Nital etch. X200.

practically scale free as compared to furnace treated wire. There is only a light oxide film present on wires electrically patented.

✦ ✦ ✦

FIGURE 18 shows a 4 wire machine for the patenting of wire by the electric direct resistance method. This machine has a production capacity of 500 lbs. per hour on a range of sizes from #9 gauge to #16 gauge.

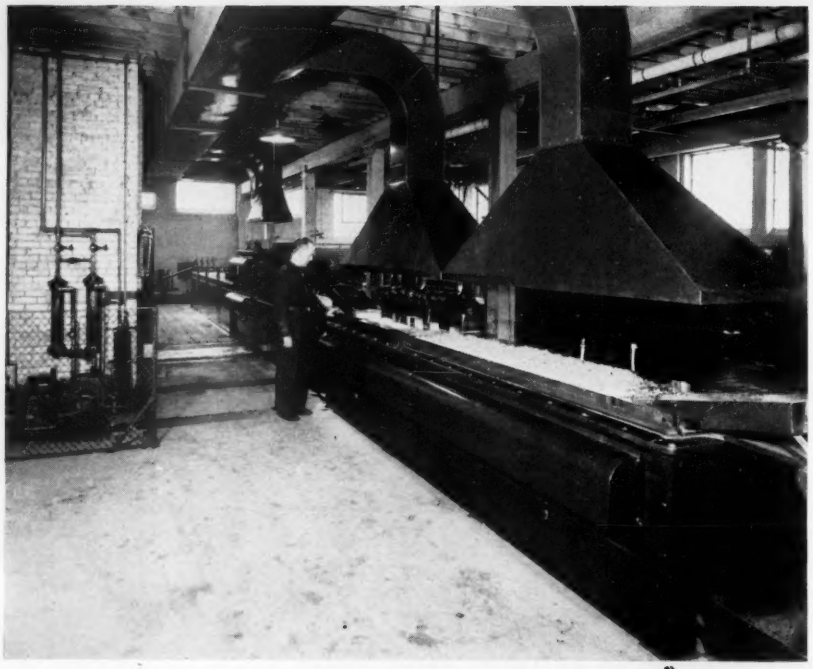

Fig. 18. 4-wire installation for electric direct resistance patenting.

Summary

THE advantages of the electric patenting treatment may be summed up as follows:

1. **Higher and more uniform physical and fatigue properties can be obtained from a given steel by resorting to electric patenting.**
2. **There is no surface decarburization and there is practically no scale, even on wire patented without the use of special atmospheres. The electrically patented wire has an excellent surface condition.**
3. **Much finer grained structures are produced than possible by furnace heating methods.**
4. **Much greater wire speeds than those used in conventional patenting practices are possible.**
5. **The heating and cooling cycles can be controlled very accurately.**
6. **The wire is quenched on a rising temperature, and exactly at the temperature required instead of on a temperature which is falling as in the usual methods.**
7. **A patenting machine can be used for the annealing of stainless steel wire and low carbon wire where the cycle of cooling is adaptable to continued strand heat treatment.**

ANNOUNCING A SPECIAL ISSUE FOR JANUARY, 1943

— SPECIAL BECAUSE —

The discussions on technical papers at the annual meeting of the WIRE ASSOCIATION will be published in their entirety in the regular January issue of WIRE and WIRE PRODUCTS.

✦ ✦ ✦

The Directors of the WIRE ASSOCIATION have approved this plan to provide these discussions to all members without extra expenditure.

✦ ✦ ✦

SPECIAL BECAUSE — The Mordica Memorial Lecture for 1942, by Louis H. Winkler, Metallurgical Engineer, Bethlehem Steel Company, Bethlehem, Pa., on the subject "STEEL AND WIRE" also will be published in this issue.

— TO OUR ADVERTISERS —

The advertising value of this special arrangement to be followed in the January issue of WIRE and WIRE PRODUCTS is obvious.

✦ ✦ ✦

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Material Conservation

by Frederic Luther,
Information Department,
Western Electric Company, New York, N. Y.

With active substitution programs under way on 80 critically scarce materials and a well planned salvage program for the conservation and reclamation of scrap and rejected parts the methods of the Western Electric Company outlined here should prove of value to all wire producing and fabricating plants. ✦ ✦ ✦ ✦

PRIORITIES, production boards, plant conversions, and rationing boards, tumbling over each other in rapid succession during the past two years, have brought home to 130 million Americans the grim lesson that we are facing the greatest test of national self-sufficency this country has ever known. Stockpiles of imported raw materials have taken on new significance in our daily lives, and the current status of the availability of aluminum is a major topic for discussion not only in manufacturing centers but remote sections of the land.

✦ ✦ ✦

AS early as July 1939 — two months before war finally broke out in Europe—President Roosevelt set up a joint Army and Navy Munitions Board for coordinating the mobilization of industry with the needs of the armed forces. This board released, before the June 1940 meeting of the A S T M, a listing of 29 strategic and critical materials—materials essential to our war program and not adequately available from our domestic sources of supply. These were:

Aluminum
Antimony
Asbestos
Chromium
Coconut shell char
Cork
Graphite
Hides
Iodine
Kapok
Manganese
Manila fiber
Mercury
Mica
Nickel
Opium
Optical glass
Phenol
Platinum
Quartz crystal
Quinine
Rubber
Silk
Tanning materials
Tin
Toluol
Tungsten
Vanadium
Wool

✦ ✦ ✦

IT must be noted here that such a list is not final. It should be recognized that, due to extremely unstable conditions in the field of critical materials, statements made here cannot hope to represent the day to day changes in the picture. Additions such as **Magnesium, Copper, Zinc, Cobalt, Burlap and Jute** have been made. Steps were taken immediately to lay in a supply of all these materials against the possible severance of our sea-borne supply lanes. Ten million dollars were earmarked by the Treasury for the creation of a reservoir of these items, and purchasers were encouraged to build up large stock piles of them.

✦ ✦ ✦

OF the items on the strategic and critical list, several are of vital importance to the wire and cable activities of the Western Electric Company. Such are:

Aluminum
Antimony
Burlap & Jute
Copper
Lead
Silk
Tin
Zinc

FREDERIC LUTHER

Educated at Cornell University, Antioch College, and the National University of Mexico. Formerly survey archeologist with the Mexican Government, acting director and lecturer at the Dayton, Ohio Public Museum, and curator of the Laboratory of Anthropology. At present with the Information Department, Western Electric Company.

✦ ✦ ✦

Rubber

PROBABLY the most vital raw material to the war effort today is rubber. So much publicity has been given in the press to this subject and the possible substitutes for this material that it is not politic at this time to talk about it. Obviously much—in fact too much—has been written on this subject and, therefore, we are going to purposely omit it from our discussion. Therefore, we shall proceed immediately to a quick study of how the other shortages have affected us.

✦ ✦ ✦

Aluminum

FIRST on the list is **Aluminum.** As you know, aluminum was the first fully recognized bottleneck in our war effort. Enormous expansion of the aluminum industry has resulted in more than tripling the manufacturers' capacity since 1940, and a 50% increase over this year's highest level is scheduled for 1943. However, war needs alone in the third quarter of this year were expected to be left short to the tune of 35% of their demands. Consider the effects of this under-capacity of one-third, when the construction of even a light interceptor plane requires fully two tons of aluminum.

✦ ✦ ✦

BELL System engineers early recognized this critical state of affairs, and set about developing alternative materials where possible. Such replacement was not difficult, as in the case of bus bars installed in battery rooms.

Here aluminum was being used until we began replacing with copper. By making this replacement, even though the cross-section of the bar can be substantially reduced, the bar's weight will be increased by approximately 100%, and, in many cases, may necessitate the redesigning of support members.

✦ ✦ ✦

ANOTHER way in which we have released aluminum from our operations is in the manufacture of switchboard cable. Here we long had used an aluminum foil tape for keeping out moisture. As the aluminum shortage appeared, we began to use paper tape coated with pliolite. Through such means **Western Electric** has been able to save, through actual replacement in manufacturing operations since the institution of the alternate materials program, enough aluminum to build over 735 P-40 pursuit planes.

✦ ✦ ✦

Antimony

YEARS ago telephone engineers began to enclose underground and aerial cables in a sheath of lead. But trouble began to appear when cable-supporting rings eventually wore their way through the soft lead coating. Searching for an alloying material to strengthen the lead, we hit upon three per cent tin. Due to factors such as the high price of tin, our search continued and finally ended in the adoption of a 1% antimony—99% lead alloy which has been the standard sheathing material for telephone cable for more than twenty years. Today, however, antimony has joined the list of critically scarce materials. Before the Sino-Japanese war started in 1937, our major supply came from China. Today, our most important source is Mexico, although Boliva also mines antimony in some quantity, and some of our Western states produce the metal during wartime.

Calcium

CALCIUM is another material which may be used in producing a strengthened lead alloy, and Western Electric is proceeding with lead-calcium studies. The Bell System has in operation today several hundred miles of this sheathing which has as yet shown no important defects. Field tests on our lead-calcium sheath for power cable by several manufacturers indicate that there are definite advantages in the use of this new alloy in the power cable field.

✦ ✦ ✦

Burlap and Jute

BURLAP and Jute are important in our war economy, for jute is the fibre from the inner bark of a tall-slender-stemmed plant normally grown only in Asia. Used in making bagging, carpets, and burlap, it finds a telephone application in asphalt-impregnated form as the exterior coating of cable buried without conduit. We have succeeded in replacing these layers with a cotton wrapping, leno cloth.

✦ ✦ ✦

Lead

THE position of **Lead** is encouraging, for, although lead was placed on the critical list nearly a year ago, we find today that we are able to get as much lead as we need for the amount of cable we are allowed to make. Additional uses we have for lead in the Bell System are as solder and as rust-proofing paint. Our domestic mines, producing over half the world's supply of lead, have actually produced a small surplus this year, and there is little prospect of having to melt up Junior's set of toy soldiers for some time to come.

✦ ✦ ✦

Tin

TIN is a different matter, as every housewife knows from the current campaigns for washed and flattened food cans. We long have been extravagant in our use of tin, and the United States has used more tin than any other country in the history of the world. Tin goes back a long way, and the British Isles were known to the ancient Greeks as the Tin Islands as long as 2,500 years ago; the famous British mines of Cornwall have held out right up to the present time. By far the greater supply of our tin came, however, from Malaya and Netherlands East Indies, with all the rest of the world producing only 10% of the supply. In addition to having been used for such purposes as weighting silk dresses, tin finds a major use as an alloy of lead in making solder, that prime essential to electricians everywhere. Surprisingly, re-processed tin from tin-plated food cans often is purer than the so-called "virgin" metal arriving from smelters, and we are using in our solder all the reclaimed tin we can obtain.

✦ ✦ ✦

THAT we are attempting to cut down on the great amount of solder—with its valuable tin content—which is used in the far-flung operations of the Bell System is shown in new manufacturing and application techniques worked out recently. One of the chief ingredients of solder is tin and efforts have been directed towards the reduction of this critical material in solder for both connecting and wiping operations.

✦ ✦ ✦

ANOTHER means whereby the amount of tin consumed is reduced is through the introduction of methods requiring less solder

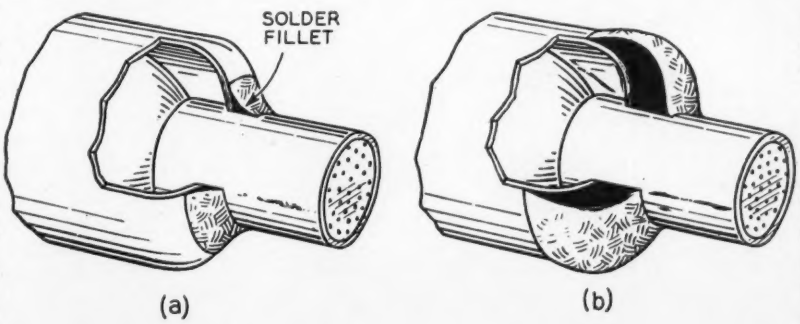

Fig. 1. "Victory Joint" Method of Soldering.

✦ ✦ ✦ ✦ ✦

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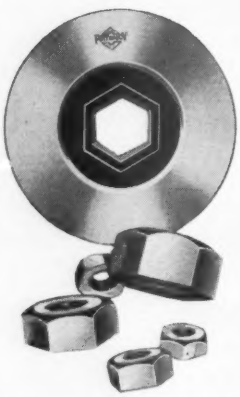

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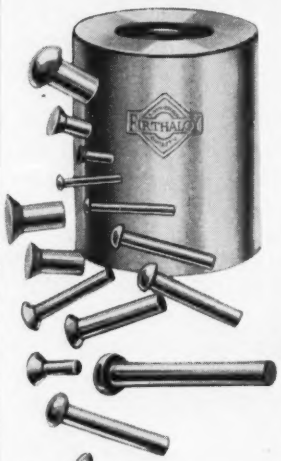

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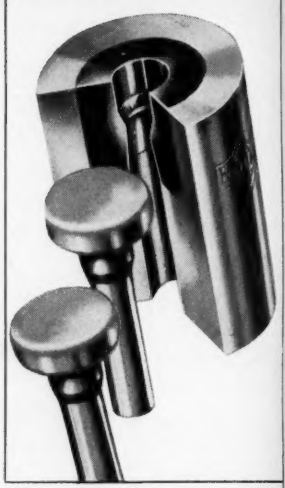

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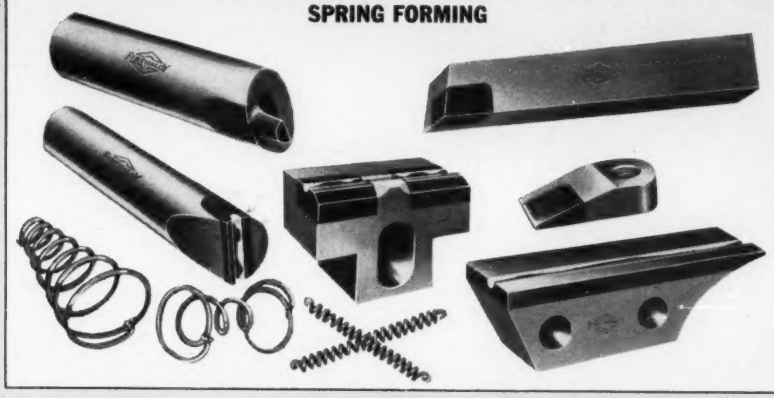

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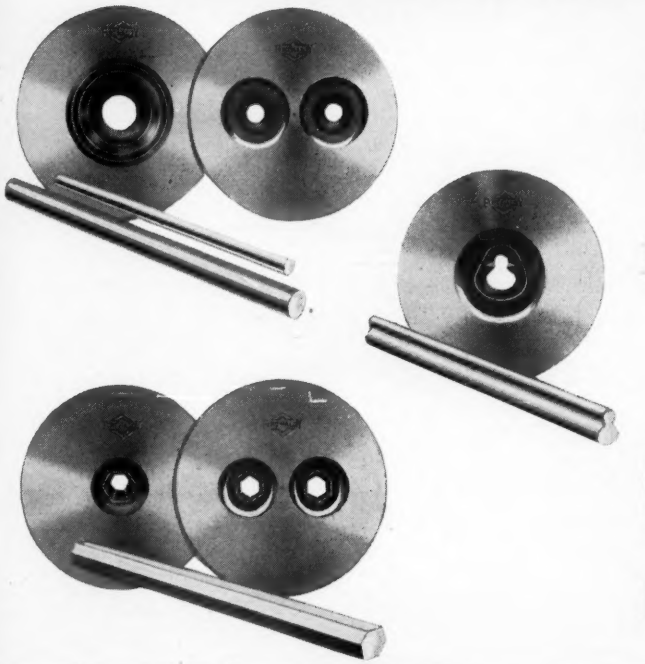

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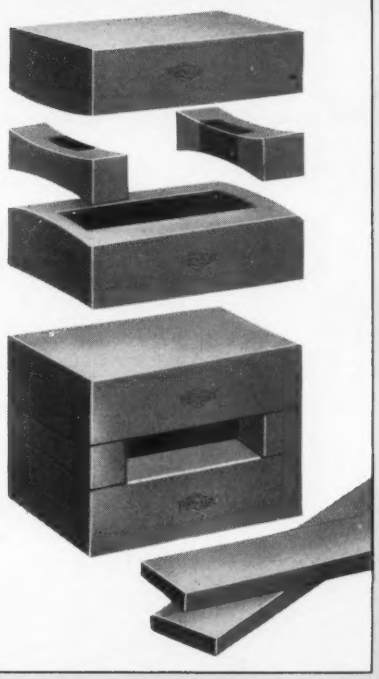

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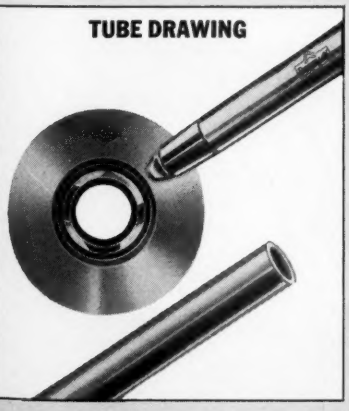

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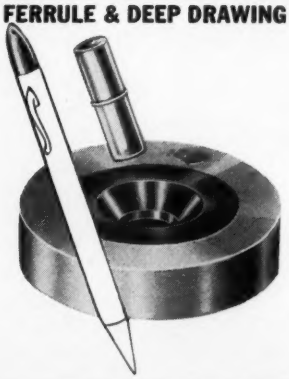

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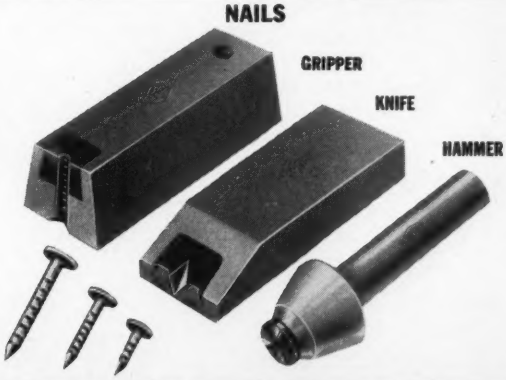

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when sealing cable ends at the factory. On large cables this is accomplished by means of a lead antimony disc inserted in the ends of the cable, and sealed with a small amount of solder, in place of the high tin content slug formerly used. Small cables are sealed by the pinch seal method which eliminates solder entirely.

✦ ✦ ✦

IN the field large amounts of solder have been saved through the introduction of the "Victory Joint" over the method formerly employed as illustrated in the accompanying sketch.

✦ ✦ ✦

Silk

SILK, of course is entirely unobtainable now, but our laboratories have been working for years on replacements for silk. This turned out to be quite a job, for not only is silk the strongest and most elastic natural fibre known to man, but its dielectric features were unequalled by most of the alternate materials originally suggested.

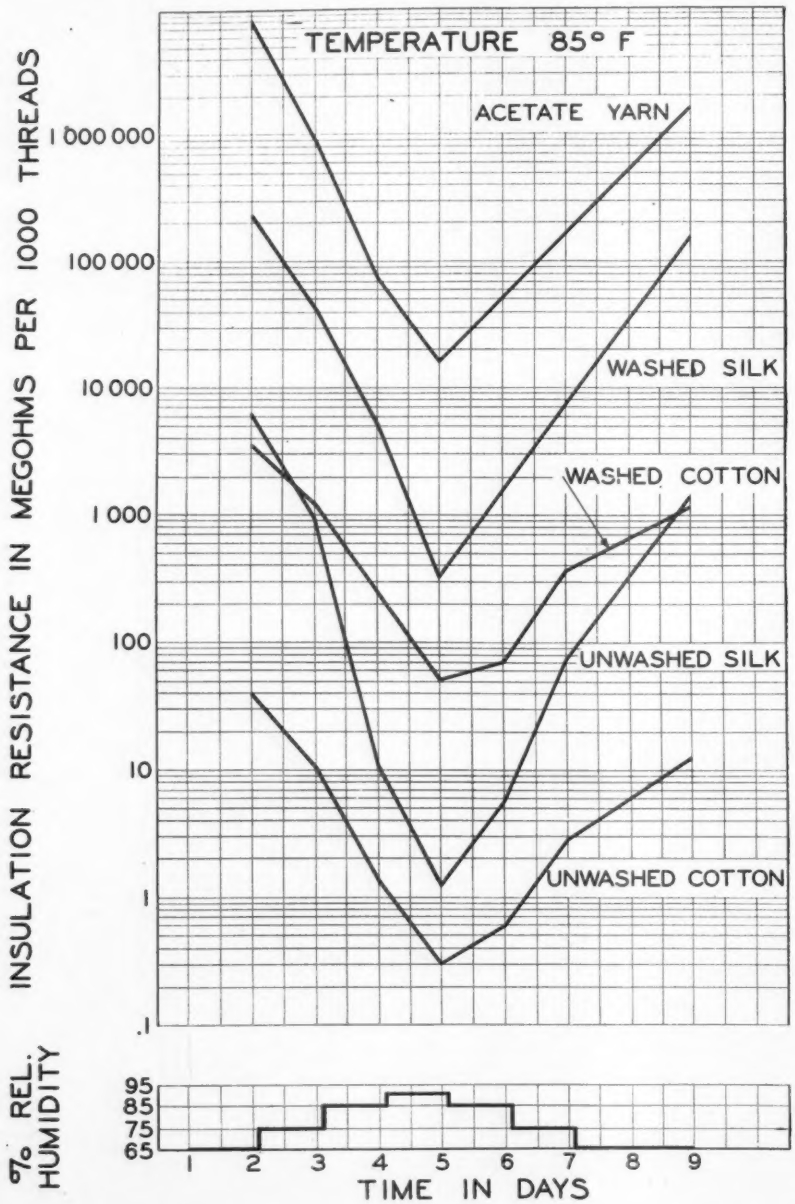

Fig. 2. Insulation Resistance per 1000 Threads.

✦ ✦ ✦ ✦ ✦

Rayon

RAYON is superior to silk in dielectric properties although not its equal in abrasion resistance. **Nylon,** which has come into the picture more recently, is superior to silk in both physical and electrical properties. Consequently, the replacement of silk insulation has been on the following basis:

1. **Rayon has been substituted where silk was formerly used under an outside protective coating of cotton.**
2. **Nylon has replaced silk where that material was formerly used alone.**
3. **Cotton has replaced silk in a few instances where silk braid was formerly used for good appearance.**

✦ ✦ ✦

Cotton

ON the other hand, it was found that the insulating properties of ordinary cotton are adversely affected by humidity, even when the cotton has been impregnated. Accordingly, a washing treatment was developed whereby we remove the soluble sodium and potassium salts normally present in the cotton. This operation is known as the **Western Electric** process of purification. It has been found that cotton purified by this process has insulating values of the order of 50 to 200 fold as compared with unpurified cotton under humid conditions. By a "boiling out cycle" certain natural oils and waxes present in the cotton, which would be damaging to the insulating properties are removed. For use, however, in insulation in non-telephonic applications such as sealed unit refrigerators, it is desirable to remove certain other oils and waxes, since a leaching action takes place with the leached impurities causing a stoppage of a capillary-type expansion valve common in these refrigerators. In such applications, the oils or waxes are emulsified or dissolved by a bleaching operation before purification, and are removed during the washing process. Either the regular purified or the bleached and purified materials can be applied to wire with the regular equipment used for this purpose.

✦ ✦ ✦

Zinc

ZINC has become extremely critical today and has been on

the 100% allocation list since June 1st. Found almost everywhere man mines lead (except in the great mines of Missouri), zinc has played an important part in industry for many years. Alloyed with copper it forms brass, a corrosion-resistant metal. So many uses has zinc that the W P B still has no adequate estimate for our overall requirements for the metal, other than that we are terribly short of having enough. Zinc coating, or galvanizing of iron prevents rust and long has been used for so protecting our outside hardware, such as cross-arm braces, messenger wire clamps, and through bolts. In some cases we have been able to eliminate the use of zinc by coating the hardware with lead or painting to inhibit oxidation, and the satisfactory results of our tests along this line have been borne out by trials conducted by the **A S T M.**

✦ ✦ ✦

Copper

HEART of telephony is **COPPER;** in the communications field this metal is one of the most difficult to replace. To a large extent, there is no commercially-acceptable substitute for its current-carrying uses. Since it is the kernel of our wire and cable manufacturing operations, our position is particularly critical.

✦ ✦ ✦

DURING its long history through the ages copper has maintained its early importance, and today it is second only to iron in industrial value. Its excellent conductive features made it of great importance to the earliest electricians, and we find that today a large percentage of all the copper used goes into the electrical industry. Although not as ductile as either silver or gold, a copper billet 4 x 4 x 54 inches will draw into a 2,500 mile strand of 42 gauge wire.

✦ ✦ ✦

THIS country's situation on copper is rather paradoxical; we have the greatest reserves of copper ore in the world, we produce half the world's total output, and we have ten times the amount Germany has; yet our copper shortage is such that about 20% of the copper needed for our war industries during the third quarter of this year couldn't be supplied. Just stop to think: in four minutes a machine gun in action uses 30 pounds of copper—enough to draw into a mile and a half of telephone wire. And telephone wire is important, too, for one phone call must be made every time $2.58 is spent on building a bomber.

✦ ✦ ✦

WE in **Western Electric** have made many changes in our copper consumption program, such as using copper covered steel instead of bronze for line wire and for drop wire, thus releasing not only the copper but also the 3% of tin which composed the bronze. We also use steel for our open wire exchange lines. And we plan to attach our drop wire to customers' premises with steel instead of copper clamps. As for the non-electrical uses of copper, they are already practically non-existent in the Bell System. Copper for conductors is still the nation's biggest use, and one of our biggest headaches.

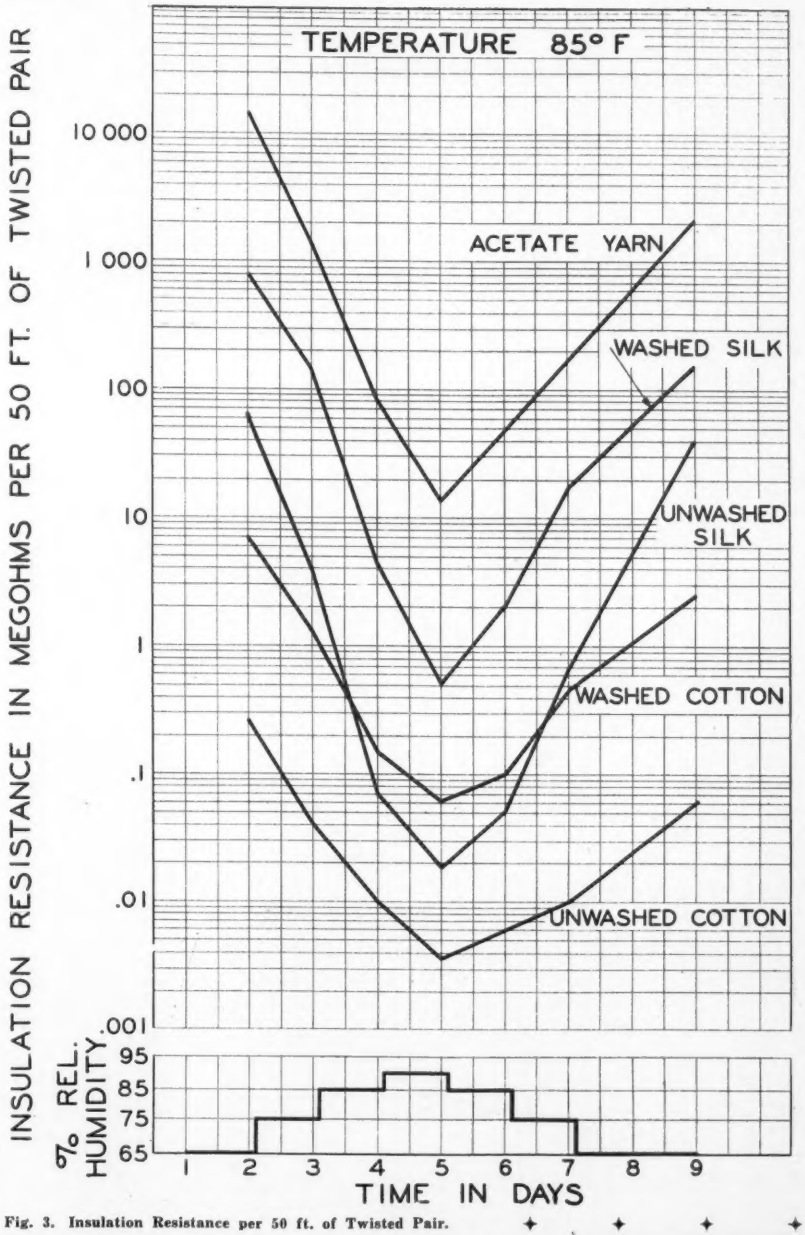

Fig. 3. Insulation Resistance per 50 ft. of Twisted Pair.

WE have talked at length here about alternates or substitutes for old standby materials. But, with priorities lists changing so rapidly, we sometimes must find substitutes for substitutes as these, in turn, become scarce. Such an occurrence may be seen in the case of the aluminum tape used to make switchboard cable moisture-proof. No sooner had we selected a pliolite tape to do the job than pliolite went on the critical list because of its rubber content. Undaunted, our engineers went to work again and came up this time with a grease proof tape of kraft paper surfaced with an amorphous wax. Another example is seen in the composition of our bus bars, described earlier in this paper as having gone from aluminum to copper. With copper so scarce, we have been looking for a substitute for that material, and it is entirely within the realm of possibility that our bus bars may see another change.

✦ ✦ ✦

Scrap and Rejects

SCRAP and rejected parts from Western Electric's manufacturing operations, as well as junked telephone equipment, long have been returned to our smelting furnaces to be melted down and recast. Most of the wornout and obsolete metal items collected throughout the entire Bell System is sent to our great salvage and reclamation plant at Nassau, to join other scrap purchased from sources outside the System. Here it is reduced to billets and pigs under strict laboratory control, after which over 95% of our total Nassau output is allocated directly to the Army and Navy or eventually finds its way into non-telephonic war industries. The rest is sent back into the manufacturing plants of **Western Electric**, where new parts are machined from the reclaimed and reprocessed metals. Many of the operations in this cycle, with emphasis on the part Nassau plays, appear in our film which you will see at the conclusion of this paper.

Telephone cable which has had to be replaced by larger cables, as well as damaged cable, and cable which may become obsolescent comes to the cable strippers at the Nassau Smelting and Refining Company's plant at Tottenville, Staten Island, New York. Here the cable is stripped of its lead sheathing, which sheathing is in turn melted and refined for reuse in the making of new cables by Western Electric for the various telephone companies.

✦ ✦ ✦

The Importance of Time

OF prime importance in the conservation program is one valuable commodity rarely associated with metals—that commodity of which we are perhaps shortest: **Time.** We are particularly interested in saving time in our manufacturing operations, for we must get the communications apparatus to the armed forces before they can take the field. Perhaps many of you heard **Mr. Brillhart's** paper read last year before this group on the high speed rotary knitting machine for insulating electrical conductors. This remarkable machine has a non-stop output of 1,500 feet and upwards per hour, and can match the output of five conventional rotary 16 carrier type braiders, meanwhile giving more light-protective covering with an equal weight of cotton. Not only have we banks of these knitters in our own plants, but they are saving 80% in covering time for our many licensees.

✦ ✦ ✦

WE have gone heavily for the saving of time by farming out our contracts. Thus, our latest figures show that 48% of all our war contracts have been subcontracted.

✦ ✦ ✦

Employment Expansion

IN our own plants we have vastly expanded the number of employees. Since we hired our first woman worker nearly 70 years ago as a magnet winder, the employment of women has been no novelty to us. But, since Pearl Harbor, our employment of women has risen astronomically, and we are using them in unusual jobs ranging from methods investigators to welders and test engineers.

✦ ✦ ✦

General Characteristics of Program

THE question is properly raised as to what general characteristics are sought and what are found in our alternate materials program. Generally, we may say that we tolerate no more impairment of service quality today — when a pilot's life may depend on an ungarbled radiotelephonic message—than we did before the world turned upside down. We do, however, usually find a shorter life, with consequent earlier re-

THE WIRE ASSOCIATION

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1. WIRE & WIRE PRODUCTS — For One Year.

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6. PERSONAL CONTACTS.

   Both at Annual and Regional Meetings, and throughout the year, for interchange of helpful information.

7. INFORMATION SERVICE ON MACHINERY, EQUIPMENT AND SUPPLIES.

   The Technical, Catalogue and Correspondence Files of the Wire Association hold the answer to practically every "Where can I buy" problem. This service is available to members without charge.

For detailed information address

RICHARD E. BROWN—Executive Secretary

300 Main Street, Stamford, Conn.

placement, in our substitute materials. And sometimes—not always—we find a slight increase in initial cost. It should be borne in mind, however, that in order to introduce many of these changes extensive development work and tool expenditures have been necessary.

✦ ✦ ✦

AS for the outlook for the future in a post-war world, who can doubt that the impetus given creative research by the necessities of this war can result in anything but the greatest technological advance — accompanied by the highest standard of living the world has ever known. Already, we have investigated some 5,000 items considered for possible alternative use in telephony, with from one to several hundred individual parts represented in each item. Already, we have active substitution programs under way on 80 critically scarce materials.

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NO, just as airplane radio communication saw its birth in **Western Electric's** laboratories and manufacturing plants during the last war, we shall one day look back on this period of mighty effort and count the benefits—many of them unknown and unrecognized until long after the initial discovery—which emanated from the telephone industry today.

AN UNPRECEDENTED DEMAND FOR FINE WIRE HAS CAUSED AN UNPRECEDENTED DEMAND FOR FINE DIAMOND WIRE DIES. WE HAVE TAKEN OUR PLACE BESIDE OUR FIGHTING MEN AND OUR FIGHTING FACTORIES TO FULFILL WAR TIME SPECIFICATIONS BOTH AS TO

QUALITY

AND

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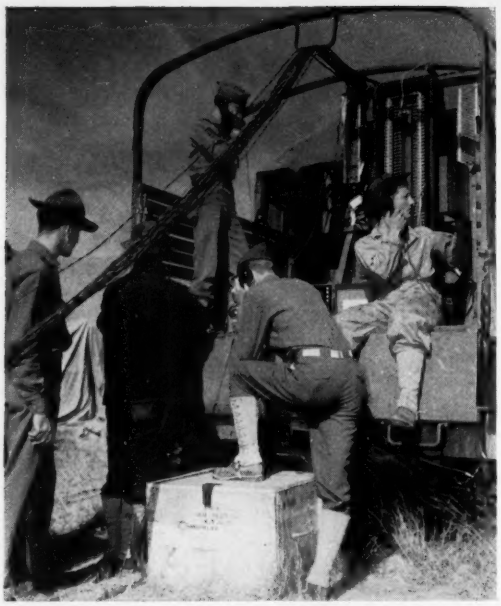
Photo shows what happens when a truck or tank attempts to run through coils of oil tempered wire, that has been laid across roads, or any place that might be used by vehicles. The engineers at the Replacement Training Center, at Ft. Belvoir, Virginia, are being well trained in using all forms of barricades. April 1942. Photo—Signal Corps, U. S. Army. ✦



1st Army Maneuvers in the Carolinas . . . Soldiers of the 56th Signal Bn. Co. B, are shown testing a field telephone switchboard set up in a truck. These soldiers are of the 1st Army Corps in bivouac at Kershaw, S. C. Oct. 24, 1941. Photo—Signal Corps, U. S. Army. ✦ ✦ ✦ ✦

SOME WIRE

Using coils of oil tempered wire, troops at the Engineers Replacement Training Center, at Ft. Belvoir, Virginia, lay huge coils of the wire on roads, or any likely place that a tank or vehicle might pass. The wire becomes entangled in the wheels when attempt it made to run through it. April 1942. Photo—Signal Corps, U. S. Army. ✦ ✦

Future engineers for the U. S. Army, training at the Engineers Replacement Center, Ft. Belvoir, Va., are given an introduction to the obstacles they will encounter when they go into actual battle. Photos show the training they receive in combating barbed wire, while using a smoke screen for protection from the enemy. This barbed wire has been strung in a criss-cross fashion for a delayed action, which will give the enemy time to concentrate and fire when the troops attempt to cross it. The men are equipped with heavy leather gloves studded with rivets for protection from the sharp barbed wire. April 1942. Photo—Signal Corps, U. S. Army.

Photo of Pvt. Robert Wallace, 21st Signal Service Co., Newfoundland, testing lines on a pole which contains over 100 telephone lines. Photo—Signal Corps, U. S. Army. ✦ ✦

1st Army Maneuvers in the Carolinas—The rewind machine, which takes care of a tedious part of servicing telephone wire for army field communications, is shown here. Spools of wire, which hold about enough wire to be strung for one mile, are checked for square knots and open breaks after use in the field. South Carolina, Oct. 23, 1941. Photo—Signal Corps—U. S. Army. ✦ ✦ ✦ ✦

USES OF IN WAR

1st Army Maneuvers in the Carolinas . . . Spools of copper wire are being unwound for use again in the field for telephone communications, by members of the 62nd Signal Battalion. Near Chester, S. C. October 23, 1941. Photo—Signal Corps, U. S. Army. ✦ ✦ ✦

1st Army Maneuvers . . . Carolina Maneuvers Area. Nov. 4, 1941. Wire laying crew of Sig. Co., 1st Div. Crew is changing drum of wire and putting loading coil into line between 1 mile long section. Photo—Signal Corps, U. S. Army. ✦ ✦

Wire Association Questions and Answers

Question No. 200-42

PICKLING

"One of our mills is very much interested in securing, if possible, technical literature or results of experiments which will give them information concerning the action of pickling tubs in cleaning steel.

What they are particularly desirous of securing is information concerning the effect of the temperature in the solution, on the rate of removing scale; the effect of acid strength on the rate of cleaning; and the effect of iron sulphate in the solution on the rate of cleaning.

We certainly would appreciate any information you might be able to give us concerning experiments or literature covering the above and, if possible, where we could address a letter securing such information. Your efforts on our behalf will be appreciated."

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Answer No. 1

"I am in receipt of your letter asking about information relative to the cleaning and pickling of steel. I take it that the member is interested in the cleaning of wire or rods, and then, of course, it depends on whether it is high carbon or low carbon.

For general information, on low carbon we carry about a 6% to 8% solution at a temperature of 160 to 180 degrees. Also we use an inhibitor, and at the present time Rodine.

In high carbon we use about the same strength solution but carry our temperature at around 130 degrees. This is done in order not to burn the wire, or as might commonly be termed 'over-pickle' wire or rods. There are many intangibles to be considered in the cleaning of wire or rods, and particularly high carbon. If a mill has a good scale-cracking arrangement in their Patenting Department, one can clean this stock much faster. Also we have found that it is vitally important to use a high pressure rinse after pickling in order to wash off as much of the acid solution as possible.

If the member could tell me the particular trouble he is having, I could more easily give him the right kind of information, for we have been, and are going through a rather exhaustive study of our high carbon cleaning brought about principally on account of high speed drawing machines.

As far as any action of the pickling tubs relating to the cleaning of wire or rods, I don't quite understand, as we have never run into any trouble of this kind. We are now entirely equipped with rubber-lined steel tubs which we further line with a sulphur brick inside.

Another thing we think is a very effective asset in our cleaning department is our agitators, which slowly but continually agitate the rods while they are in solution."

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Answer No. 2

"You may be able to obtain some information from the Cleveland Tramrail Co. who have had quite a bit of experience in installing pickling equipment for various rod manufacturers."

The Wire Association is for the specific purpose of improving production methods. It has been organized as a clearing house of ideas on technical problems and research work in all phases of practical wire drawing and wire working.

The inquiries discussed were received from and answered by members of the Wire Association. These inquiries are sent to the Secretary of the Association who acts as a central clearing point, and neither the names of the firms, or individuals sending in the inquiry, or of the men or firms replying are divulged without permission.

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Answer No. 3

"We suggest that you call your client's attention to the 'Drei-Brite' cleaning process which eliminates acid pickling for removing scale from wire, rod and strip."

✦ ✦ ✦

Answer No. 4

"We have your letter regarding some sources of information on pickling practices and are pleased to refer you to the following:

Pickling of Iron and Steel, by Wallace G. Imhoff, published by the Penton Publishing Company, Cleveland, Ohio.

This is a fine book and covers all phases of the subject. Price $5.00 and can be had from Penton."

✦ ✦ ✦

Answer No. 5

"I believe the best literature in regard to pickling iron and steel will be found in the National Metals Handbook, pages 1131-1138. This information also includes reference to a book by Wallace G. Imhoff. As you know, the National Metals Handbook is put out by the American Society for Metals, Cleveland, Ohio.

I am sure these references will give you very good information on pickling of iron and steel as well as non-ferrous metals."

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Answer No. 6

"Regarding acid practice, the best summary and bibliography I know of is in the pickling chapter in Bonzel's book."

✦ ✦ ✦

Answer No. 7

"My suggestion is that the party concerned refer to the various articles published in WIRE & WIRE PRODUCTS, and from that a study can be instituted by a chemical engineer who can ascertain the data requested. There are so many variables in the cleaning operation, particularly on various types of products to be cleaned, that it looks like individual study must be made. Based on information already given in Wire Association conventions plus the publications, it is my opinion that this is an excellent foundation for getting the required data. I could not ascertain this problem because there is nothing definite or specific on what type of product is to be cleaned; and if I did, it would be a long drawn-out thesis to give information from which the questioning party could study."

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Answer No. 8

"The request for information as quoted is quite general and broad and, therefore, it is rather difficult to give any specific data which might serve to solve the problem involved.

Insofar as temperature and acid strength on rate of scale removal is concerned, when pickling with sulfuric acid both can vary over rather wide limits depending upon the nature of the scale to be removed, the analysis of the steel, and the type of surface desired on the pickled material. Acid strengths can vary anywhere from about 3% to 15% by weight, and, with a given time and temperature, it will be found that higher concentrations of acid will result in slightly faster scale removal. As the temperature of the pickling solution is increased from about 110°F. to about 175°/180°F. the rate of scale removal is greatly increased. However, as temperatures are increased, the danger of overpickling and consequent pitting of the surface of the steel is forever present particularly if the ferrous sulphate content of the bath is rather high. Inhibitor life and action is also somewhat reduced when elevated pickling temperatures are employed.

Although it requires a greater length of time to remove a given amount of scale when pickling at lower temperatures, it will be found that a more uniform pickling can be accomplished at temperatures of from 125°/140°F. when dealing with high carbon steels. Obviously, this cannot be done economically if pickling capacity is unavailable. If fatigue properties of the pickled article must be given consideration, it is known that high pickling temperatures have an adverse affect.

With regard to ferrous sulphate and its effect upon pickling, it can be said that with increasing amounts of ferrous sulphate in the bath pickling action becomes less uniform and danger resulting from pitting is increased particularly with high pickling temperatures. If control of ferrous sulphate content can be realized, it will be found that maintenance of its content below a certain maximum figure will result in general improvement of the uniformity of the quality of the pickle. Its control is obviously difficult and dependent upon factors among which extent and type of scale are probably most important.

As pointed out above, the inquiry is of a general nature and consequently it is only possible to answer it in a general way. However, if the member of the Association would care to divulge the particulars of their pickling prob-

lem, I would be glad to give them whatever specific data I have available which might be of help to them.

In order for them to obtain literature on pickling and pickling investigations, I would recommend that they contact the American Society for Metals, at Cleveland, Ohio, or refer to the various journals of both the British and American Iron and Steel Institutes. Further, contacting the various concerns which supply inhibitors, among which there are many good ones, should enable them to obtain a wealth of information on pickling practice."

✦ ✦ ✦

Answer No. 9

"Replying to your inquiry, I would write pages on pickling practices, yet, there would be a variety of opinion for there is no definite standard of practice in the pickling industry.

Some firms pickle with very high temperatures such as 215° to 225°F., some up to 160° to 170°. Again, there is no definitely prescribed percentage of acid used for pickling. Some mills insist that 12 to 15% of sulphuric acid is the best and others may start with 8%, claiming the same results, though there may not be any pronounced variation in the type of the steel pickled.

I have also seen the use of mixed acids such as sulphuric mixed with a small percentage of nitric acid, or solution of plain hydrochloric acid. It is definitely found, however, that the best temperature for steel pickling is between 175° and 190°F. It is also definitely erroneous to claim that higher temperatures such as 215° to 225° will increase the pickling efficiency. It is true that steel mills since the last 2 or 3 years have resorted to extreme pickling temperatures and almost doubled the output. This however, is not due to the temperature as such, but due to the violent agitation in the pickling solution caused by the high temperature. In other words, the solution being violently agitated prevents accumulation of hydrogen gas on the surface of the steel and permits constant access of fresh acid to every particle of steel.

In England two years ago they had maintained temperatures of 175° to 190° and have replaced the action of higher temperatures by rapid circulation of acid solution creating a greatly increased washing effect. The result was that the output was practically doubled despite the relative low temperature applied.

For steel, the best pickling practice known from a standpoint of the efficiency and economy is the use of 8 to 12% sulphuric acid solution at 175° to 190°F. The formation of hydrogen gas on the surface and underneath the scale, tends to loosen the scale and also theoretically prevents somewhat the access of fresh acid, which as stated above, is overcome by circulation.

From an economic point of view, pickling with high temperatures should not be recommended. Sulphuric acid does not evaporate by the extremely high temperature. The violent action of the steam will tear away particles of acid which will be deposited in the condensation process either in the building itself or in the sewer.

The pickling equipment such as tanks, etc. are naturally shortlived when constantly exposed to temperatures of 215° to 225°F. Pickling with strong hydrochloric and nitric acid, though very efficient, cannot be done at above mentioned temperatures since these acids rapidly evaporate, which considering the cost of these acids, would constitute severe and very expensive losses.

I could go on for quite a while without exhausting the subject. I suggest, however, that you get in touch with The Wallace G. Imhoff Co., Vineland, N. J. (Mr. Wallace G. Imhoff, Met. E., President). Mr. Imhoff has written quite an interesting book on pickling and cleaning metals and I would strongly recommend writing for the book."

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Answer No. 10

"We do not have any printed literature on the subject referred to. However, it has been our experience in pickling operation with sulphuric acid, the factors of iron and acid being normal, the higher the temperature, the faster the pickling operation. Of course also the higher the temperature the greater the evaporation.

Acid strength up to about 20% with iron and temperature being normal, will cause faster pickling than lower temperatures.

Iron sulphate in the pickling solution, regardless of temperature and acid strength will slow up pickling.

Temperature for the average grade of low carbon steel at about 180 degrees F., with acid at about 7% and iron at a minimum, will give the best results.

✦ ✦ ✦

Questions and Answers Now Pending

The following inquiries are now pending in the office of the Wire Association. Any reader who is interested in securing further information or who can furnish data in connection with any of the inquiries is invited to write to Richard E. Brown, Executive Secretary, The Wire Association, 300 Main Street, Stamford, Conn.

✦ ✦ ✦

Question No. 201-42

An inquiry from a Uruguayan company for one machine for covering wire three layers of cotton yarn, one braiding machine for covering wire with two layers of cotton yarn and one armature coil making machine to make traction motor coils.

✦ ✦ ✦

Question No. 202-42

An inquiry from Argentina for die polishing machines and sources of supply.

✦ ✦ ✦

Question No. 203-42

An inquiry from Chile for the following equipment:

Copper Mill.
One copper rod mill.

Wire Drawing and Annealing Department.
One bull block machine wire winder and pointer.
One 10-die tandem wire drawing machine with spooler and stringing-up machine.
One 14-die drawing machine with spooler and hand swaging machine.
Two 16-die block type drawing machines.

Wire Cleaning and Tinning Department.
One tinning outfit complete for large sizes of wire and one for fine sizes of wire.

Wire Stranding and Bunching Department.
Two planetary 19-wire-250 bobbins —Strander.
One 7-wire tubular strander.
Two double bunchers.

Weatherproof Wire and Cable Department.
One universal winder.
Ten 12-16-20 braider machines.
One braider table for twenty braiders.

Rubber Wire Insulating Department.
Three double rubber mixing and sheeting mills.
Three Royle No. 2 tubers.
One strainer.

Braiding and Pairing Department.
Two universal winders.
280 - 16 carrier No. 2 braiders.
Seven braider tables.
Two pairing machines.

Cotton and Silk Covering Department.
One universal winder.
Two single deck insulating machines, 8 spindles each.
One double deck insulating machines, 16 spindles.
Nine double head horizontal insulating machines.

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Question No. 204-42

An inquiry for a list of wire manufacturers producing copper wire in South America.

✦ ✦ ✦

Question No. 205-42

A request for the analysis of steel wire rods used for valve spring wire. S. A. E. 9260 (used by Buick) and Amola Steel .60 carbon (Used by Chrysler).

✦ ✦ ✦

Question No. 206-42

An inquiry from Australia for complete equipment for a copper wire and wire insulating plant, and also a man to take care of the engineering and design of same.

✦ ✦ ✦

Question No. 207-42

An inquiry from a company who can produce approximately 18,000 pounds weekly of .011 bare wire and .022 covered wire and would like to know market among target practice cloth manufacturers.

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Question No. 208-42

An inquiry asking for a list of companies manufacturing gold plated wire.

✦ ✦ ✦

Question No. 209-42

An inquiry from India for plants and machinery for drawing copper wire No. .30 and finer, directly from copper ingots, and for the time being, would like to buy drawn copper wire in different diameters and alloys. These wires are to be used in the gold and silver thread industry.

✦ ✦ ✦

Question No. 210-42

An inquiry from a company in India wanting to buy tungsten carbide with which to make their own wire drawing dies.

Cemented Carbide Manufacture and Applications

By A. MacKenzie,
Vice President Charge Manufacturing,
Carboloy Company, Inc.,
Detroit, Michigan

The war has speeded up the applications of carbide dies including drawing operations of automatic and semi-automatic machine as well as wire drawing. This article describes the manufacture and application of cemented carbide to industry with particular reference to the wire, tube, and bar drawing field.

UNDER the impetus of defense and war industries, cemented carbides within the past few years have in this country grown from laboratory scale operations to large plants employing hundreds of workers. This expansion has been built on a foundation of experience and knowledge accumulated in the decade before the outbreak of the European war.

✦ ✦ ✦

THE wire industry has had a major role in culturing and developing the industry, as a matter of fact conception was the result of a search for diamond die substitutes for the drawing of tungsten wire.

✦ ✦ ✦

THE cemented carbide products commercially available utilize tungsten, tantalum and titanium in combination with carbon for the forming of the carbides. These carbides are bonded with a soft lower melting binder material such as cobalt. With the exception of carbon, these materials are either on allocation or are on the scarce list and therefore subject to strict government control.

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AS the cemented carbides, per pound of raw material used, have inherent productivity capacity many times that of other commercial materials, we—in the industry—expect to have raw materials made available to us when needed and justified by proper priority and allocation ratings. As a matter of fact, productive developments are taking place in the domestic and western hemisphere which makes the basic raw material picture quite hopeful and no real difficulty is expected unless, of course, new products or uses develop that are more important and gain priority over the present uses.

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Manufacture

AS starting powder for cemented carbide, tungsten carbide is made by mixing tungsten powder with lampblack and firing for a few hours at 1400 to 1500°C. (2500 to 2700°F). Tantalum and titanium carbides may be made somewhat similarly but, due to difficulty in producing the metal powders initially, they are more often made by heating the oxides with carbon at substantially higher temperatures.

A. MacKENZIE
Vice President Charge Manufacturing
Carboloy Company, Inc.,
Detroit, Michgan

✦ ✦ ✦

BINDER or matrix metal, such as cobalt, is made in powder form by well-known mechanical or chemical methods. Control of particle size is of importance to both binder and hard constituents. Grain size measurements are commonly made, and are used to regulate later operations in process, particularly milling and sintering.

✦ ✦ ✦

CARBIDE powders may be milled in ball mills or other types of crushing or grinding devices to bring to the desired grain size for processing to a given structure. On the other hand, carbide powders as first made may be of a size which requires no milling. In any case the carbide or carbides are mixed or milled with the softer binder metal, generally until each carbide particle has been coated with a more-or-less continuous layer. This requires from a few hours to a few days.

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AFTER the milling operation, a lubricant such as paraffin or stearic acid (½ to 2% by weight) is usually added to powders which are to be pressed cold. In the hot pressing process this lubrication is not needed. Cold pressing is done at a pressure of 5 to 30 tons per sq. in. Molds are of hardened steel or cemented carbide. Equipment is similar to that used in pressing other kinds of powders. Depending on size of the compact, presses

Fig. 1. Vibrating screens used to sift powdered metals.

may be of the hydraulic type capable of giving several hundred tons pressure on the ram, or they may be of the tablet type of a few tons capacity. The powder to be pressed is packed loosely in the deep mold, filling it to about three times the height which will be occupied after pressing. Powders do not flow well in pressing, and extreme care must be taken that there is a uniform initial distribution of loose powder in the mold.

✦ ✦ ✦

SHAPES which can be pressed successfully are limited largely to those having a high degree of symmetry. More intricate shapes may be made by pressing first to a simple form, then machining or grinding to the shape desired. A low temperature heat treatment or presintering may be given the pressed piece to increase its strength somewhat prior to such forming. The pressing lubricant is thus removed, and the compact assumes a chalky structure with sufficient strength for easy handling. Little or no shrinkage occurs.

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DURING sintering of the pressed compacts the material assumes its final physical state. This heat treatment is usually carried out under conditions of partial melting, solution, and reprecipitation, and has much influence on the desired final characteristics. Sintering is performed in a neutral or reducing atmosphere; hydrogen is often used in the presence of carbon, and decarburization may thus be prevented. A shrinkage of 12 to 20% in linear dimensions occurs and a sound material requires that this shrinkage occur uniformly. Presence of objectionable impurities may cause uneven shrinkage, with resultant pits, voids, and porous areas, so localized as to be injurious to the material even though their presence does not result in a significant variation from the desired density.

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MINUTE porosity is encountered in much of the commercial cemented carbide. The causes probably do not differ essentially from those resulting in similar defects in cast metals—namely, impurities, solid and gaseous, and improper heating and furnace conditions; pressing technique, mixing and milling methods

Fig. 2. Pill press for pressing small tool blanks or die nibs.

may be at fault. A product free from porosity and of high uniform density is desired.

✦ ✦ ✦

SINTERING temperatures are based upon the requirements for a satisfactory commercial product and are usually within the range of 1350 to 1500°C. (2450 to 2725°F.). Both batch and stoking methods are used. In the batch method the charge is placed in the cool furnace; the temperature is gradually raised to the maximum, held there for a determined time, and allowed to cool. In stoking or continuous sintering, the material is packed in trays which enter the cool end of the furnace and are slowly moved along zones of gradually increasing temperature until final sintering

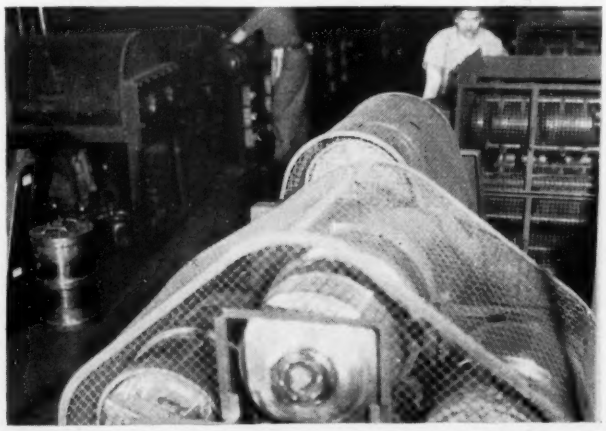


Fig. 3. Ball mills used for mixing and grinding carbide materials and binder.

Fig. 4. Hydrogen atmosphere electric furnace used for brazing.

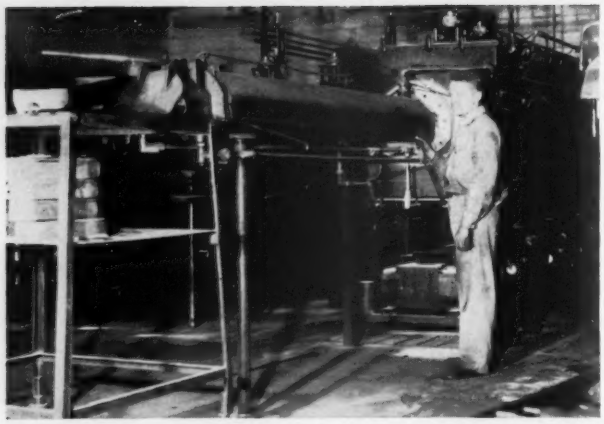


Fig. 5. Hydrogen atmosphere electric furnace used for sintering.

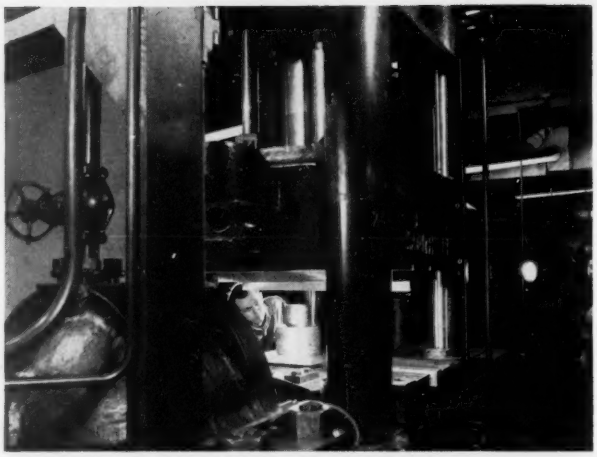


Fig. 6. Large hydraulic press for pressing large dies and other large sections.

is attained, after which they continue through the furnace and into a cooling chamber.

IN the process commonly known as the "hot press method," the pressing and sintering operations are carried on simultaneously. The powder is placed in a suitable enclosed mold, usually of graphite. The mold and its contents are heated to sintering temperature while sufficient pressure is imposed in one direction to overcome the forces which cause shrinking in the other two directions when a cold-pressed compact is freely heated. The molds are ordinarily heated electrically to approximately the sintering temperature used in the cold press method. Heat may be applied indirectly from a resistance furnace or may be generated within the mold itself by resistance or by high frequency current. Suitable protection against oxidation serves to prevent undue deterioration of the mold. Pressures of 400 to 2500 psi. are commonly used.

ANOTHER process recently developed is that of extrusion capable of making rods, tubes, non-symmetrical cross sections, such as angles, flats, half-rounds, ovals, etc. and in lengths not hitherto obtainable.

THE transition from laboratory scale to productive stature has brought about the development of equipment capable of producing cemented carbides in large and varied shapes and sizes up to a 50-pound piece. By way of example, Figs. 1-7 represent equipment now commercially in use. Figs. 8-11 show a variety of sizes and shapes recently fabricated.

THE physical properties of cemented carbides have been ably listed in an article written by Dr. E. W. Engle and printed in Powder Metallurgy published by A.S.M. under date of June 1942. Some of the properties, such as the extreme hardness as well as high red hardness; high compressive strength, high resistance to abrasion are outstanding in a commercial product.

THE cemented carbide pieces are generally supported, as in tools, by utilizing a steel shank to which the cemented carbide tip is attached, generally by brazing. In dies, the cemented carbide nib is generally supported by a steel case which can be cast, forged, or shrunk-fit around the nib.

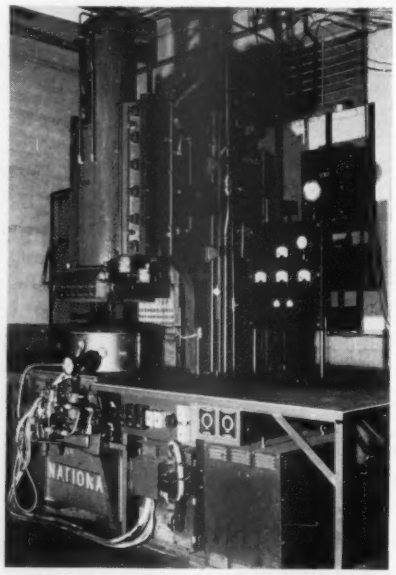


Fig. 7. Hot press for simultaneously pressing and sintering large sections.

Application

CEMENTED carbides are today performing a national service that cannot be measured in sales or manufacturing volume as they are being universally applied throughout industry in one form or another for the purpose of speeding up much needed production. The statement has been made that the cemented carbide industry, due to the impetus of war, has advanced its normal growth by a minimum of ten years.

IN the wire, tube and bar drawing field, we have seen peace time uses replaced by military requirements with rigid specifications and tolerances, and cemented carbide dies and mandrels are now being used widely to help meet these requirements and in some instances cemented carbides are the only materials that will do the job successfully.

IN the wire drawing field, the cemented carbide material is generally tungsten carbide with varying amounts of binder material. The tendency is to use cemented tungsten carbide grades with high binder content for the larger dies and for applications where resistance to shock is the prime factor.

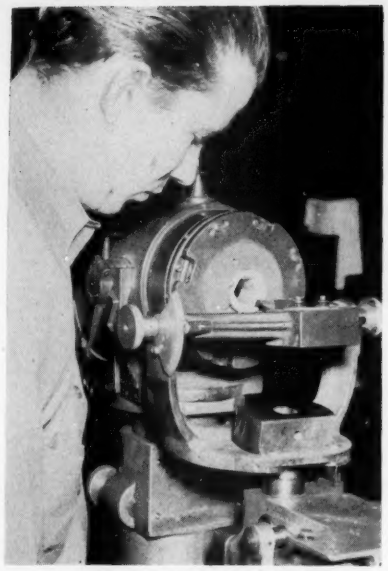


Fig. 8. Forming shaped dies while cemented carbide in presintered condition. ✦ ✦

THE grades containing low amounts of binder are used for applications where resistance to abrasion or erosion is needed, also where resistance to corrosion —sometimes found in wet drawing—is needed.

✦ ✦ ✦

SOME die materials are available containing tantalum carbide as an additive to the tungsten carbide and binder. It is claimed that in some wet drawing applications the resistance to corrosion is thereby increased. The trend is towards grades with the lower binder content, which is natural due to improved cemented carbides, improved casing methods, improved care and maintenance in use.

THE various manufacturers, through their service and sales engineers, have accumulated a knowledge and experience that can be used to good advantage in selecting the proper cemented carbide material, although in passing it can be stated, I believe, that our experience has indicated that it is difficult to properly appraise the performance value of variations in physical properties, or compositions of cemented carbide die materials due to the many variables encountered in the wire drawing field.

✦ ✦ ✦

CEMENTED carbide dies are being used for drawing steel wire down to .010″ in size and in a few instances as low as .005″.

✦ ✦ ✦

IN copper drawing, cemented carbide dies are used down to about .040″.

✦ ✦ ✦

IN the drawing of alloys and rare metals, cemented carbide dies are being successfuly used, for example — stainless steel, brass, copper beryllium, nichrome, dumet, tungsten, molybdenum, silver, platinum, etc.

✦ ✦ ✦

AS time passes, it is expected that cemented carbide dies will make further progress in competing in the field now reserved to diamond dies. During this period, scarcity of diamond dies may well be a factor that will speed up the transition.

Fig. 9. Cemented carbide blanks for tools being loaded into boat for final sintering. ✦

AT this point, it might be well to stress the necessity for proper care and maintenance of all types of cemented carbide dies and tools to get maximum performance. This is more important now than ever, as by proper care you can tremendously improve the life and by so doing require less with the result that the saving in tungsten and other scarce materials can be of real and important value to our national effort, and I counsel all users to make an effort in this direction. All of the cemented carbide suppliers have available a care and maintenance program for tools and dies. This

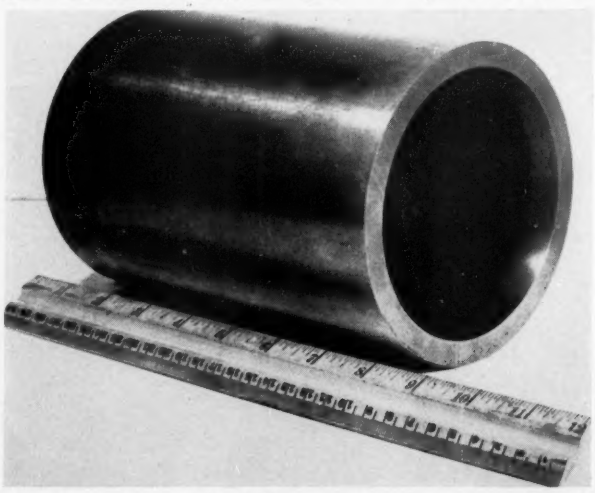
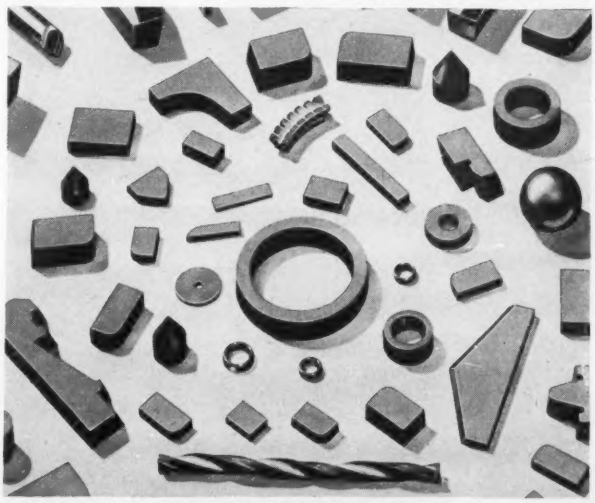


Fig. 10. Large cemented carbide insert for pointing die, weighing approximately 50 lbs. ✦ ✦ ✦ ✦



✦Fig. 11. Pieces of cemented carbide of various sizes and shapes. ✦

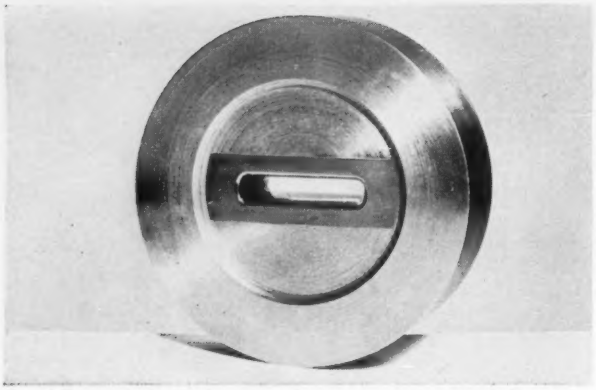


Fig. 12. Die for drawing rectangular stock.

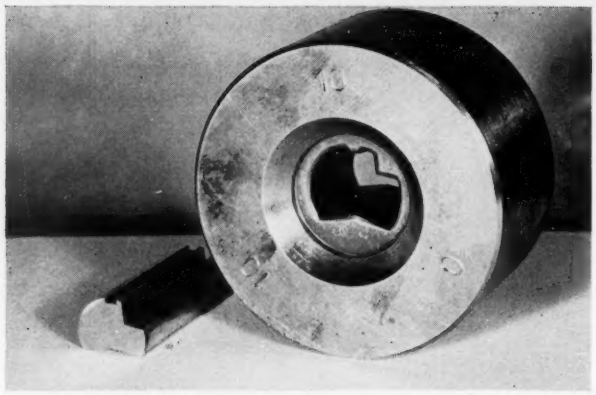


Fig. 13. Die for sizing irregular shape.

program may vary in detail but, if properly and continuously followed will bring real savings to the user and fundamentally will bring benefits to the manufacturer.

✦ ✦ ✦

CEMENTED carbide dies in a variety of sizes are being successfully used for the drawing of bar stock in round, flat, square, hexagonal and other standard shapes. Many special shape dies are also being used. Round bar stock up to 3½" diameter is being commercially drawn. Steel, copper, brass and cupro-nickel tubing in a variety of small and large sizes are being drawn through cemented carbide tube dies and over cemented carbide mandrels.

✦ ✦ ✦

THE war has tremendously speeded up the application of cemented carbides to stamping or drawing operations on automatic and semi-automatic machines. Cemented carbide dies were used for the drawing of an item—such as bases for incandescent lamps; now, however, cemented carbides are being widely used in the production of small and large caliber cartridge cases for the reason that the output per machine is materially increased due to less down time for die changes, also the uniformity of product can be maintained over a greater number of pieces. Production records of 1,000,000 pieces per die change, against an average of 50,000 pieces when using steel dies, are shown.

✦ ✦ ✦

CEMENTED carbide dies for the various steps in the drawing operations are made for 30, 45 and 50 caliber as well as for 20mm through to 105mm cartridge cases and other special sizes.

✦ ✦ ✦

OTHER applications in the manufacture of cartridge cases are for nosing and tapering dies. Nosing dies have a cemented carbide insert weighing about 50 pounds and are now being used. Figures 12-17 show pictures of various dies and mandrels used for drawing shapes, cartridge cases, tubes, etc. Some of the other cemented carbide die applications are bolt sizing and extrusion, eyelet and stamping dies, of a variety of sizes and shapes.

✦ ✦ ✦

WHERE wear is a factor, the cemented carbides are being successfully applied to reduce machine down time as well as to improve the product. Some typical applications are guides for stranding machines, guides for spring coiling machines, coating dies used in the manufacture of welding rod, surfaces for anvils used in wire straightening operations on straight and cut machines as well as others; facings and inserts for molds used in the powder metal, ceramic, chemical and other fields, as well as for wear surfaces on many types of gauges; another wear application of some importance is the facing of centerless grinder work rests or blades with cemented carbides.

✦ ✦ ✦

IN the cutting tool field all types of tools are being tipped with

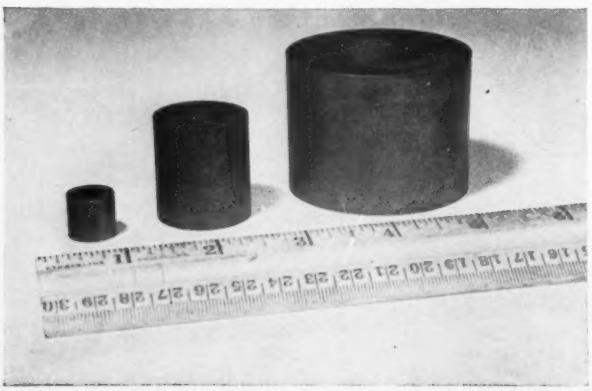


Fig. 14. Cemented carbide nibs for mandrels.

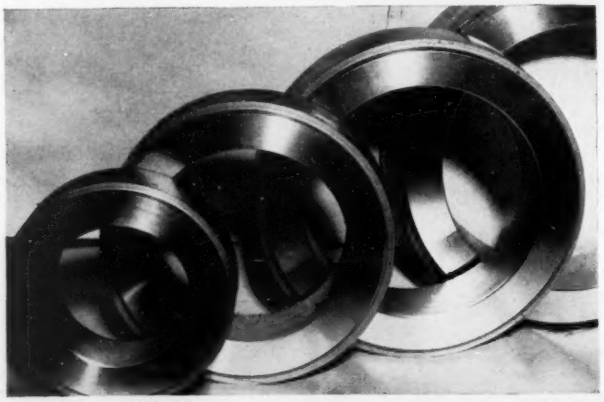


Fig. 15. Cemented carbide nibs for cartridge case drawing die.

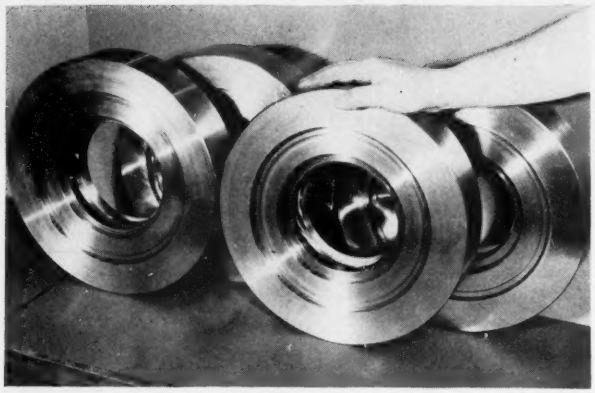


Fig. 16. Cemented carbide cartridge casing dies.

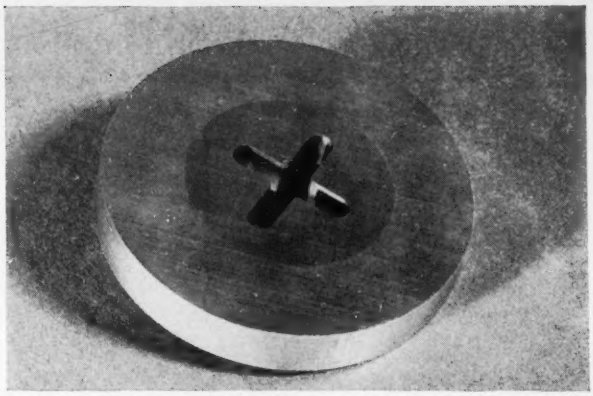


Fig. 17. Cemented carbide die for use in molding ceramics.

cemented carbides from the complicated form tools to the simple single point tools. These tools are being used in the war industries to produce more implements of war in the shortest possible space of time. With cemented carbide tools it is generally possible to get more pieces per grind resulting in less down time, more pieces per unit of time, resulting in greater productivity per machine or per unit of floor space as well as maintaining uniformity of size and shape over an increased number of units.

✦ ✦ ✦

ANOTHER benefit has been the ability of the cemented carbides to machine materials, such as armor plate, at an economical cost not hitherto possible or practical.

✦ ✦ ✦

AS a matter of interest, the application of cemented carbides in the United States for the cutting of all types of steel has increased rapidly during the past few years. One prominent cemented carbide manufacturer will produce this year, in steel cutting cemented carbides, 120 times his 1939 production. The result of this is that all types of war implements made from steel and machined are being produced at a rate not possible with tools other than cemented carbides.

✦ ✦ ✦

SPECIAL mention might be made of the application of cemented carbide tools to maintenance work and machine shops. All manufacturers of cemented carbides have available standard lines of single point tools which can be used economically and well in such operations.

✦ ✦ ✦

ANOTHER item of general interest is cemented carbide drills designed for the drilling of concrete and brick.

✦ ✦ ✦

THE wire industry can be complimented on the excellent use they have made of cemented carbides in helping to solve their wire drawing problems, so it is possible that further applications can now be found in other phases of your industry.

ANNOUNCING A SPECIAL ISSUE FOR JANUARY, 1943

— SPECIAL BECAUSE —

The discussions on technical papers at the annual meeting of the WIRE ASSOCIATION will be published in their entirety in the regular January issue of WIRE and WIRE PRODUCTS.

✦ ✦ ✦

The Directors of the WIRE ASSOCIATION have approved this plan to provide these discussions to all members without extra expenditure.

✦ ✦ ✦

SPECIAL BECAUSE — The Mordica Memorial Lecture for 1942, by Louis H. Winkler, Metallurgical Engineer, Bethlehem Steel Company, Bethlehem, Pa., on the subject "STEEL AND WIRE" also will be published in this issue.

— TO OUR ADVERTISERS —

The advertising value of this special arrangement to be followed in the January issue of WIRE and WIRE PRODUCTS is obvious.

✦ ✦ ✦

Revised rate card will apply to this issue — Closing date, December 20th, 1942.

✦ ✦ ✦

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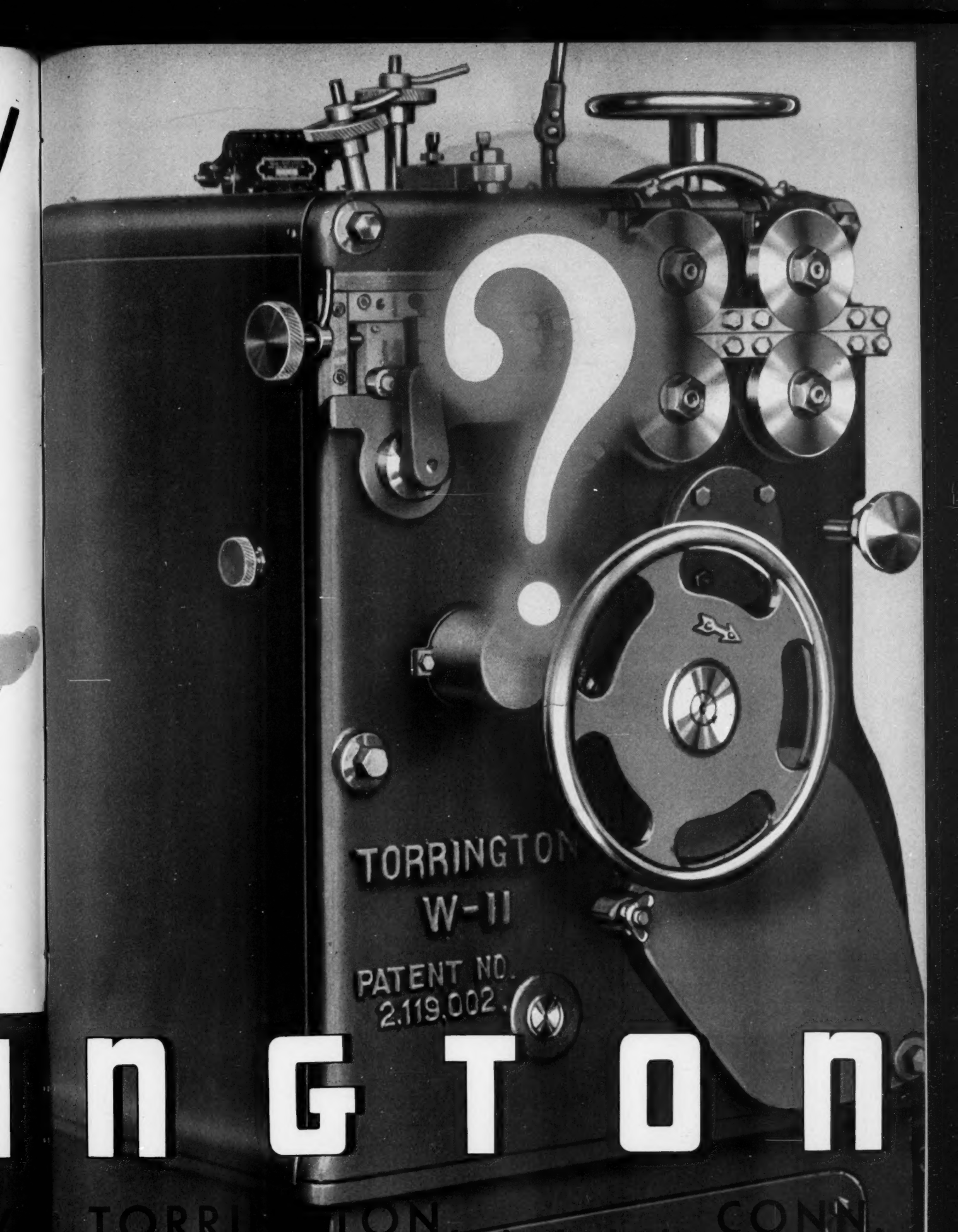

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Modern Electroplating

A Book Review

By F. R. Morral,

Assistant Professor of Metallurgy, School of Mineral Industries,
Pennsylvania State College, State College, Pa.

Recently the Electrochemical Society published a book on the Symposium on Electroplating they held in the Fall of 1941 in Chicago. This meeting was timely because although there is a decided curtailment in the plating industry of civilian articles, electroplating is perhaps of greater use in the military industries. Relatively small amounts of metal are necessary for plating, parts can be salvaged fairly easily and finally because of the usefulness of electroplating in the repair of worn parts. The title of the book mentioned above is "Modern Electroplating" and analyzes the importance of electroplating to the wire industry.

MANY metals have desirable properties, either of corrosion resistance to certain media, hardness, etc., and yet are too expensive to make the part completely out of them or it may not be possible to fabricate them, and that is where electroplating comes to the rescue.

✦ ✦ ✦

THIS review is made having in mind the interests of the Wire industry, and its dependents, such as nails, bolts, etc.

✦ ✦ ✦

General

THE first chapter in the book deals with the general principles and methods of electroplating, a joint contribution of **Drs. W. Blum, A. O. Beckman and W. R. Meyer.** The fundamental principles of electroplating and the newer theoretical developments are discussed. A section is devoted to the control of solutions by means of pH meters. Properties of the deposits and structure of electrodeposits are analyzed in its various aspects.

✦ ✦ ✦

Alloy Plating

ALLOY plating **(C. L. Faust, page 59)** indicates the principles of simultaneous plating of two metals. The Wire industry is mostly interested in decorative and in corrosion resistant coatings. Among the first the following combinations of metals have been successfully established: Nickel-cobalt, nickel-zinc (or nickel-cadmium) copper-zinc, copper-tin, zinc-molybdenum, nickel-molybdenum; amongst the latter cadmium-zinc, copper-tin, tungsten-nickel, nickel-cobalt, tin-zinc; and lead alloys with either thallium, bismuth, tin or silver look interesting. Deposition of chromium alloys is wide open for study in the stainless finishing of metals.

✦ ✦ ✦

Brass Plating

A CHAPTER is devoted to brass plating **(H. P. Coats, p. 87)** and its use for obtaining rubber adhesion to other metals is pointed out, and for some ornamental purposes.

✦ ✦ ✦

FROM then on the various authors discuss one metal at a time. The articles follow consistently a certain pattern. A short introduction of historical interest of the metal under consideration, together with the properties of the metal and the uses of the coating, is followed by a discussion of the principles of plating the metal, and the function of the constituents of the bath. This bath consists of the metal or metal salts used and other constituents which act as buffers or antipit agents (usually wetting agents) and finally, addition agents which may be inorganic or organic. These addition agents have a decided effect on the finished coating, the purpose being to make coatings bright. Operating conditions, characteristics, maintenance and control, analytical methods for the constituents of the bath, anodes, equipment and tests of deposits are presented in fairly uniform succession. In each case the authors point out the importance of the preparation of the basis metal **(See F. R. Morral, Wire and Wire Products vol. 17, p. 288 (1942)).** The highlights of these plating processes are presented in Table I.

✦ ✦ ✦

Cadmium Plating

CADMIUM Plating **(G. Soderberg and L. R. Westbrook, p. 101)** provides an attractive corrosion protective coating on various basis metals, especially on iron and steel, but also on copper and copper rich alloys and other metals and alloys. Aircraft, marine and military outdoor uses are common. For ornamental purposes it is mostly used indoors because of price and since there, thin coatings suffice. In the discussion on this paper Lyons pointed out that tests on wire and strip steel using cadmium undercoats of various thicknesses with a rather heavy zinc coating over it, did not last as long in industrial atmospheres as a straight zinc coating of equivalent thickness. The preference of use of cadmium on bolts and other threaded parts used in marine atmospheres is because the corrosion products from cadmium are apparently more soluble and do not interfere with the replacement and inspection of these parts, if necessary.

Chromium Plating

CHROMIUM plating **(G. Dubpernell, p. 117)** is commercially desirable because of the properties of this metal: high resistance to atmospheric corrosion at ordinary and at elevated temperatures, high degree of hardness and wear resistance, low coefficient of friction and good reflectivity. There are two types of chromium plate: 1. thin coatings on metals for ornamental purposes. This type of coating usually has intermediate coatings of other metals. 2. "Hard" or industrial heavy chromium coatings. Their use is justified because of the resistance to heat of these electrodeposits, as well as resistance to wear, resistance to corrosion and erosion and low coefficient of friction. This hard chromium should be plated on a sufficiently hard basis metal for best results.

✦ ✦ ✦

Cobalt Plating

COBALT plating, **(G. Soderberg, W. L. Pinner and E. M. Baker, p. 145)** as such, is carried out only in small amounts at present. In "Bright Nickel" plating cobalt is codeposited with nickel because it whitens the latter and improves the corrosion resistance of the plate of either metal alone. While cobalt costs four time more than nickel it is unlikely that it will displace it. **Dr. Fink** in the discussion pointed out that on adding cobalt to nickel the corrosion resistance increases tremendously, so that an alloy of 50 parts of cobalt and 50 parts of nickel is far more corrosion resistant than either metal alone.

✦ ✦ ✦

COPPER may be plated from acid or from cyanide solutions, there existing several of the latter. These may be classified as shown in Table A.

Acid Copper Electroplating

ACID Copper Electroplating and Electroforming **(L. H. Winkler, p. 155)** baths have the following advantages:

1. Ease and simplicity of operation and maintenance
2. relatively high cathode efficiencies
3. high limiting current densities (on steel strip 3000 amperes per square foot have been used)
4. scarcity of cyanide and limited nickel supplies favor increase in the use of this method.

✦ ✦ ✦

THE disadvantages have been listed as follows:

1. Limitation in the thickness of deposit (.001 inch) on stationary cathodes
2. these coatings require buffing or polishing
3. acid copper does not produce cleaning action on work during plating.
4. deposits cannot usually be made directly on iron, steel, zinc and other metals
5. Do not obtain bright deposits—although recent developments look promising in improving this condition.

✦ ✦ ✦

Cyanide Copper Bath

THE High Efficiency Cyanide Copper bath **(H. L. Benner and C. J. Wernlund, p. 173)** is a proprietary solution. It does away with the recognized deficiencies of the Rochelle and other type cyanide baths (2, 3, 4 above), which are:

1. variations in anode and cathode efficiencies (30-70%) make solution control difficult, promote cyanide decomposition and result in objectionable gassing.
2. Limited cathode current densities together with low cathode current efficiencies necessitate unreasonably long plating times for production of heavy deposits in modern plating cycles.

✦ ✦ ✦

IN addition, bright deposits up to .002 in. in thickness may be produced with this bath.

✦ ✦ ✦

Rochelle Copper Plating

ROCHELLE Copper plating **(A. K. Graham and H. J. Read, p. 185)** is used extensively to prevent case-hardening of specified areas of ferrous metal surfaces. These copper deposits are also used as undercoats for nickel and chromium deposits.

✦ ✦ ✦

Gold Plating

GOLD plating **(L. Weisberg and A. K. Graham, p. 199)** applications are determined by the unusual properties of this metal.

✦ ✦ ✦

Iron Deposition

IRON deposition **(C. T. Thomas p. 211)** has very limited applications today, although interest is growing because of the use of iron powder in powdered metals metallurgy. Recovery of iron from iron and steel pickling solutions in the Wire industry's mills might make possible a saving in acid and a revenue from the iron so recovered. Research on chloride and sulfate pickling baths should be interesting.

✦ ✦ ✦

Lead Plating

LEAD plating **(A. G. Gray and W. Blum, p. 221)** is of interest to the wire industry because of the possibilities of this coating particularly when zinc and tin are scarce or expensive. Lead electroplating may be considered superior to lead hot dipping because no alloying element (tin favors wetting of steel) or bonding element (zinc which forms intermetallic compound with the base metal steel. Lead wets zinc and the iron-zinc compounds) is neces-

TABLE A

Bath	1 Sulfate (acid)	2 Cleaner (cyanide)	3 Regular Cyanide	4 Rochelle Type (Cyanide)	5 High Speed Cyanide
Purpose	Electroforming Electroptyping Metal Powders	Cleaning Striking	Incidental Cleaning Striking Plating	Incidental Cleaning Striking Plating	Plating
Rochelle salt added	.....	Sometimes	None	Always	None
In use today	Extensively	Occasionally	Extensively	Extensively	Extensively

sary. The electro-deposit is supposed to be less porous and does not have the contractile stress of hot dipped lead due to a 3.5% shrinkage on solidification.

✦ ✦ ✦

THE various plating solutions used have the following characteristics:

Advantages

a) **Fluosilicate bath**

1. Cheap for large scale operation

b) **Fluoborate bath**

1. Fine grained, dense deposits
2. less susceptible to decomposition
3. Gives satisfactory plate chiefly on steel

Disadvantages

a) **Fluosilicate bath**

1. Bath difficult to prepare for small scale plating
2. Bath decomposes into silica and lead fluoride
3. Will not plate directly on steel

b) **Fluoborate bath**

1. More expensive than fluosilicate
2. Bath materials very corrosive and require special precautions in preparation and use.

For quality these coatings should be pore free.

✦ ✦ ✦

IN the discussion **Dr. Blum** pointed out an interesting use of lead plating during the last war. Twenty thousand 75 mm shells which were underweight were salvaged by lead plating. The resistance of lead coatings to industrial, as well as to marine atmospheres, particularly if painted over and then any pores present are closed, is noteworthy.

✦ ✦ ✦

Nickel Plating

NICKEL plating **(W. L. Pinner, G. Soderburg and E. M. Baker, p. 235)** is very important primarily as a protective coating on steel, brass and zinc die castings. Most of the modern plating solutions are based on the Watts bath. The "Bright" Nickel is obtained from essentially the same composition solution which is completed by an addition agent. There are two types of addition agents:

1. **Cobalt salts and some aryl sulfonic acid.**
2. **Lead and zinc salts, selenium, tellurium, and aldehydes, ketones and other organic compounds.**

✦ ✦ ✦

The Platinum Group

ELECTRODEPOSITION of the metals of the Platinum group **(K. Schumpelt, p. 275)** is narrowed down to rhodium, platinum and palladium as having practical application. Research is on the way to improve the method to plate the last two.

✦ ✦ ✦

Silver Plating

SILVER plating **(N. E. Promisel and D. Wood, p. 285)** has been discussed recently in the technical literature as a possible substitute for some of the other critical metals, such as nickel, tin, etc. In the discussion on this paper the difficulties of plating silver directly to steel were pointed out, as well as the type of coating obtained and the effect on the industrial use of silver. It was noted that films .000001 to .0000001 in. thick of berrylia may be plated on silver and copper to protect them from tarnishing. A heat treatment must follow the plating.

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Tin

TIN, as many of the previous metals, may be plated from acid solutions **(P. R. Pine, p 315)** or from alkaline solutions **(F. F. Oplinger and F. Bauch, p 329)**. The first is of particular interest to the wire industry because already many miles of strip tin are electro tin plated. A desirable feature of tin is, that although it is an expensive metal, once electrodeposited it is cheaper than other metal which does not tarnish. The porosity of various tin coatings .00012 in. thick on steel have been rated as follows: 1. Composite coating obtained by plating tin on hot dipped tin, 2. bright acid tin, 3. smooth acid tin, 4. hot dipped coating, 5. alkaline tin deposit, 6. rough, matte acid tin deposit. On stretching the tin coated steel. the order of porosity had changed as follows: 1,4, 3, 6, 5, 2.

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ADVANTAGES of electroplated versus hot dipped tin are—uniform and smooth deposits, thinner coatings and lower cost metal. The advantages of acid tin over alkaline tin are:

1. faster (2.64 times as much tin per ampere hour)
2. cheaper from power standpoint (10.5 times more tin deposited per kilowatt-hour)
3. the bath is operated close to room temperature (See table I)
4. Control of bath composition easier. Turbidity of bath is slower to appear. The acid bath contains single metal ions and it is possible to stabilize them with reducing agents.

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Zinc

ZINC can also be plated from acid solutions **(E. H. Lyons, p 343)** and from cyanide solutions **(R. O. Hull and C. J. Wernlund, p 359)**. These types of zinc electroplating may be listed as shown in Table B.

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THE author discusses at length the low acid-soluble zinc anode method, yet considerable tonnage of steel wire is plated by the high acid-insoluble anode method **(See L. H. Winkler, Wire and**

TABLE B

Type	Acid ($ZnSO_4$)		Cyanide		
Process	low — acid — high		Cyanide (regular)	Zinc-Mercury Process	Bright Zinc
Anode	Soluble	Insoluble	99.75% Zn	98.25% Zn .5-1.% Hg.	99.8% Zn
Control of Solution	pH 3.5-4.5	not critical	Yes	Yes	Very critical
Current density amps./sq. ft.	1500	2000	55-110	40	2-100
Uses	wire, strip	wire sheet	small parts	small parts	small parts steel strip

TABLE I

Data on Modern Electroplating

Anodes	Metal Plating Composition of solution	oz./gal.	Temperature °F.	pH	Current Density amp./sq. ft.	Volts	Current Efficiency in %	Thickness of coating in in. Uses
75% Cu 25% Zn	**Brass No. 1**							
	CuCN	3.5			9		75	.00002-.0002
	$Zn(CN)_2$	1.5	80-95	10.3-11.0				Rubber Bonding
	Total CN	6.0						
80% Cu 20% Zn	**Brass No. 2**							
	CuCN	3.6	75-100		3-5	2-3		
	$Zn(CN)_2$	1.2						
	Total NaCN	7.5						
	Na_2CO_3	4.0						
	Ammonia, 1 pt./100 gal.							
	Brass No. 3							
	CuCN	2.4	80		4			Rubber Bonding
	$Zn(CN)_2$	1.3						
	Free NaCN	1.6						
Soluble Cd. or Insoluble Steel	**Cadmium Plating — a) still b) barrel**							
	CdO 3-5.2	2.7-4.3	68-95		5-50		85-95	.00015-.0005 also "bright" dip
	NaCN 11.57-17	⅝8-15						
	Addition Agent							
Insoluble (Pb)	**Chromium No. 1**							
	CrO_3	53.3	104		50-144	4-10	10-15	.00001-.00002 decorative .001 & more, hard plate
	SO_4	.53						
	Chromium No. 2							
	CrO_3	33.						
	SO_4	.33	131		40-288			
Cast or rolled Cu	**Copper—Acid Bath**							
	$CuSO_4 5H_2O$	20-33	70-122		28-56		100	Electrotyping, etc.
	H_2SO_4	6-13						
	Glue	.0004						
Electrolytic Copper	**High speed Copper**							
	CuCN	12-20	168-185		10-100	a) still 1-2.5 v. b) 3-4	100	Bright deposit up to .002 in.
	NaCN	13.5-22.5						
	Free NaCN corresponding to NaOH or KOH	.5-1.5 3-5 4.2-7						
	Brightener	1.5-2.5						
	Antipit agent	.15-.25						
Cast ball cast and electrolytic Cu	**Copper, Rochelle Salt Type**							
	CuCN	2.5-6.0	122-176	12.2-12.8	70		30-70	.00065 on steel to be coated with Ni & Cr
	NaCN	3.5-7						
	Na_2CO_3	2 -8						
	Rochelle salt ($KNaC_4H_4O_6.4H_2O$)	2 -4						
	Copper	4 -8						
	Free NaCN	.5-1.						
	Brightener (Pb)	.002-.004						
	Copper Cyanide—regular							
	CuCN	2.0		variable				.0005-.001, where plate used or parts to be case-hardened
	NaCN	3.0						
	Na_2CO_3	variable						
	Cu	1.4						
	Free NaCN	.8						
Lead	**Lead No. 1**							
	$2PbCO_3.Pb(OH)_2$	20	77-105		20		100	.001
	50% HF	32						
	Boric acid	14						
	Glue	.025						
Lead	**Lead No. 2**							
	$2PbCO_3.Pb(OH)_2$	40			30		100	.05 by barrel plating
	50% HF	64						
	Boric acid	28						
	Glue	.025						

Wire Products, vol 16, p 687, (1941)).

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IN the discussion **Mr. Hogaboom** pointed out the usefulness of the zinc chloride-acetate bath. Research is in process to produce bright acid zinc deposits without the need of polishing the coating. Addition agents are being tried and X-ray data of these coatings seem to indicate that not only the crystal size of the deposited zinc. but also the orientation is critical.

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TO the present time the advantages of zinc cyanide baths over the acid zinc baths rest on: 1. throwing power, 2. bright deposits, 3. adaptability to low cost equipment. It's disadvantages are: 1. slow speed of application, 2. Initial cost of solution higher, 3. Maintenance of solution higher, 4. Not applicable for coating certain types of basis metal, e.g. malleable and cast iron.

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IN the "bright" zinc bath rigorous control of solution composition and high purity is required. After plating a bright dip in a dilute oxidizing acid is used.

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THE authors point out the importance of the use of addition agents which are effective in one or more ways.

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Summary

THIS book on **"Modern Electroplating"*** is completed with a series of 11 tables in the Appendix.

NEXT October at the Detroit Meeting, a paper on the Electro deposition of hard Nickel **(W. A. Wesley and E. J. Roehl, Preprint 82-1) is to be presented,** Nickel of hardness of 380 to 480 Vickers is deposited. This will be particularly suitable in engineering applications which have to do with our War effort, such as surfacing, the forming of unusual shapes and the salvaging of worn and mismachined parts.

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INDIUM is another metal of interest, papers on plating this metal have been published in the Transactions of the **(Electrochemical Society** for the years 1940 (vol. 178) and 1941 (vol. 79).

***Published by the Electrochemical Society, Summer 1942, N. Y. ($5.50)**

TABLE I (Continued)

Anodes	Metal Plating Composition of solution	oz./gal.	Temperature °F.	pH	Current Density amp./sq. ft.	Volts	Current Efficiency in %	Thickness of coating in in. Uses
Lead	Lead fluosilicate bath a) still b) barrel Lead 10 24 Total fluosilicate 20 18.6 Glue .025 .72		95-105		5-80	0.1-.2 v at 10 amp./sq. ft.	100	
99% Ni, rolled, depolarized	Nickel—Watts type bath $NiSO_4.7H_2O$ 32 $NiCl_2.6H_2O$ 6 H_3BO_3 4 Antipitting agent		110	1.5-3.0 & 2-5 4.5-5.6	40		90-100	grain size .000004 in. or less
Tin	Tin—acid solution $SnSO_4$ 4-12 H_2SO_4 4-20 Addition agent (various) .06-13		70-80		10-40 (400)	.6 v. at 10 amp./sq. ft. 1.6 v. at 40 amp./sq. ft.	99	.00006-.00012
Pure Tin	Tin—alkaline bath a) still b) barrel $Na_2SnO_3.3H_2O$ 12 20 NaOH 1 2.5 Na acetate 2 3 H_2O_2 (100 vol. 1/16		140-180		10-25	4.0	75	.0001-.003
98.5-99.9% Zinc	Zinc plating—acid $ZnSO_4.7H_2O$ 32-54 Addition Agent		75-85	3.5-4.5	10-30 & 500-1500	4	99	0.0001-0.0015
99.75% Zinc	Zinc Cyanide—conventional $Zn(CN)_2$ 8 NaCN 3 NaOH 7		104-122	12.2-12.7	10-20		90-95	
98.25% Zinc .5-1.0% Mercury	Zinc—Mercury Process a) still b) barrel $Zn(CN)_2$ 5 8 NaCN 3 4 NaOH 4 6 Hg salt .03 .03		86-122		40	4-6	90	
99.8% Zinc and other Zn-Al, Zn-Hg, Zn-Ca & Zn-Mg	Bright Zinc Plate a) still b) barrel $Zn(CN)_2$ 8 11 NaCN 2.5 10 NaOH 10 15 Addition Agents .06-3.3		82-100°F.		10-50	a) 1.5-6 b) 10-15	75-95	

Special Added Feature

25 ASM Group Meetings on Increasing Production of War Products

Here are twenty-five ASM war production sessions — a special added attraction for October's National Metal Congress and War Production Edition of the National Metal Exposition in Cleveland's Public Auditorium — that 1200 metal men have helped prepare.

These leading authorities have listed these as the most urgent "Don't Know How" topics before the metal industry today and have asked that the "Know How" information be mobilized at this big meeting.

Twenty-five war production sessions — led by authorities in government and business, with Information Panels to answer questions from the floor in an informal, off-the-record manner.

These special sessions will be in addition to all the regular sessions of the four cooperating societies — more than a hundred papers in all. They will be in addition to the educational and conference displays of 250 manufacturers who have reserved space in the Exposition.

Bring your questions seeking problems — this is your opportunity and your responsibility to participate in an engineering conference that will help win this war of metals. Remember the date, October 12 thru 16.

N. B. While 250 manufacturers have already reserved 95 per cent of the display space; fine locations are still available. Write for complete details to A.S.M. 7301 Euclid Avenue, Cleveland, Ohio.

Segregation, Collection and Reclamation of Scrap.

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Use and Interpretation of Radiographic Inspection.

Current Achievements in Powder Metallurgy.

Training and Handling Inspectors.

Salvage of Broken Tools and Maintenance of Equipment.

Doing More with What We Have in Increasing Production from Open-hearth Plants.

Increasing Yields of Electric Furnaces (Electric Steel Manufacture).

Problems Associated with the Large Expansion of the Steel Foundry Industry.

Doing More with What Alloys We have by Using NE Steels (two sessions).

Doing More with Low Alloy and Carbon Steels by Use of Special Additions in Steel Manufacture ("Intensifiers").

Doing More with Available Tool Steels.

Speeding the Job by Better Production Heating for Softening (Hot Working & Annealing).

Speeding the Job by Better and Faster Production Hardening.

Manufacture and Heat Treatment of Magnesium Castings.

Fabrication of Aluminum Sheet.

Making Better Use of Secondary Metals.

Getting By with Low Tin Alloys.

Employee Training in Metal Working Departments (Fabrication).

Methods and Materials for Surface Protection.

EVENT

THE NATIONAL METAL CONGRESS AND WAR PRODUCTION EDITION NATIONAL METAL EXPOSITION

TIME

OCTOBER 12 TO 16, MONDAY THRU FRIDAY

PLACE

CLEVELAND'S PUBLIC AUDITORIUM

THEME

INCREASED PRODUCTION OF WAR PRODUCTS

THE WIRE ASSOCIATION — 1942

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THE Wire Association is a non-profit organization of wire mill executives, superintendents and foremen. It also includes plant engineers, traffic men, and all others engaged in the production of cold drawn bars, rods, wire, strip, insulated wire and cable, and the manufacture and fabrication of finished wire products, including cold headed, extruded and other cold worked metal products.

THERE are separate divisions for all the separate major interests in the wire industry, steel, iron, brass, copper, alloy, and precious metals, together with divisions relating to drawing, cold working, cold heading, extruding, fabricating, forming, spring making, wire cloth, wire rope, bare and covered electric wire and cable and all other forms of wire and wire products.

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PURPOSES

ITS specific purpose is to improve production methods and afford a clearing house for ideas on management problems, technical problems, and research work in all phases of practical wire drawing and wire working, and to develop and maintain friendly relations among the members.

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ACTIVITIES:

The Association functions along the following lines:

1. The use of the Association headquarters as a central clearing house for information and data of all kinds which may be of interest to members.
2. The exchange of ideas on processes of production including machinery, technical processes, etc.
3. The establishment and maintenance of friendly relations among the members of the association and the development of sectional and national meetings to discuss matters of mutual interest.
4. Studies of production methods and analysis of production costs.
5. Developments in the use of new materials and new applications of existing materials and by-products.
6. Research and collection of information on personnel management, including such factors as labor turnover, seasonal changes in the demand for employees, wage scales, etc.
7. Standardization and simplification as a means for the effective elimination of waste.
8. Such other subjects as may be determined upon.

✣ PROGRAM ✣

Wire Association Convention---1942

Cleveland, O., October 12-16, 1942. Association Headquarters — Hotel Carter

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The Exposition and Show of the National Metal Congress Will Be Open from Monday to Friday Inclusive, All Day and Every Evening During the Week Except Thursday Evening.

✦ ✦ ✦

Wire Association Headquarters at The Hotel Carter Will Be Open From 9:00 A. M. to 11:00 P. M. During the Entire Convention—Come and Get Acquainted!

✦ ✦ ✦

THERE WILL BE A REGISTRATION FEE OF $5.00 FOR THOSE ATTENDING THESE TECHNICAL SESSIONS AND INFORMAL MEETINGS

✦ ✦ ✦ ADMISSION WILL BE BY BADGE ONLY ✦ ✦ ✦

Open Discussions Will Be Held On the Papers Presented and These Discussions Will Be Published in the January, 1943, Issue of Wire and Wire Products.

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Firth-Sterling Steel Company,
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CHAIRMAN OF COMMITTEE

MEETING ROOMS
EDMUND D. SICKELS,
Advertising Manager,
"Wire & Wire Products,"
Stamford, Conn.
CHAIRMAN OF COMMITTEE

The Technical Sessions End Thursday in Order that Friday May Be Available To Make A Thorough Inspection of the National Metal Exposition.

MONDAY, OCTOBER 12

10:30 A. M.
DIRECTORS' MEETING

12 NOON
PROGRAM COMMITTEE LUNCH

Registration and Information. (Mezzanine of Hotel Carter) — October 12-16 — in charge of Mrs. R. S. Spengel, Secy.-Treas., WIRE & WIRE PRODUCTS.

— The Technical Sessions —

ALL RESEARCH PAPERS ARE PREPRINTED IN THE OCTOBER ISSUE OF WIRE AND WIRE PRODUCTS

The Discussions and the Mordica Memorial Lecture Will Be Printed in the January, 1943 Issue of Wire and Wire Products

MONDAY, OCTOBER 12 Afternoon Session — 2:30 P. M.	H. H. Timbers, Contract License Manager Chairman of Meeting	Western Electric Company, New York, N. Y.
OPENING ADDRESS	Carl E. Johnson	President of the Wire Association
PAPER: "The Wire Industry's Part in Industrial Conservation"	Ivon B. Tilyou, Assistant Utility Co-Ordinator	Industrial Salvage Section War Production Board, Washington, D. C.
SOUND MOTION PICTURE: "Mines Above Ground"		Western Electric Company, New York, N. Y.
PAPER: "Materials Conservation"	Frederic Luther	Western Electric Company New York, N. Y.

TUESDAY, OCTOBER 13 Morning Session — 9:30 A. M.	Earle H. Thomas, Superintendent Chairman of Meeting	George W. Prentiss Company, Holyoke, Mass.
PAPER: "Reducing Accidents in Wire and Wire Products Operations"	R. H. Ferguson, Manager of Safety	Republic Steel Corp., Cleveland, Ohio
PAPER: "Scheduling and Planning the Wire Mill for War Production"	L. D. Seymour, Assistant Works Manager	Canada Works, Steel Company of Canada, Ltd., Hamilton, Ontario, Canada

TUESDAY, OCTOBER 13
1:00 P. M.

WIRE ASSOCIATION ANNUAL LUNCHEON — HOTEL CARTER

— GUEST SPEAKERS —

DR. ARTHUR J. CULLER,
The American Red Cross — Cleveland, O.

CAPT. MELVIN L. PAYNE, U. S. A.
War Department, Washington, D. C.
TOPIC: "The Progress of the War"

Dr. Charles Copeland Smith,
National Association of Manufacturers, New York, N. Y.

(Members are at liberty to bring guests to hear these interesting speakers. Ladies are welcome and members and guests of other societies participating in the National Metal Congress are also invited to attend.)

TUESDAY, OCTOBER 13 4:00 P. M.	Wire Association Annual Meeting	Carl E. Johnson, President, The Wire Association Chairman

WEDNESDAY, OCTOBER 14 Morning Session — 9:45 A. M.	W. B. Farnsworth, Chief Metallurgist Chairman of Meeting	Pittsburgh Steel Company, Monessen, Pa.
PAPER: "Cemented Carbide Manufacture and Applications"	A. MacKenzie, Vice President Charge Manufacturing	Carboloy Company, Inc., Detroit, Michigan
PAPER: "Trouble Shooting on Bronze and Steel Weaving Wire"	L. D. Granger, Asst. to Vice President	Wickwire Spencer Steel Company, New York, N. Y.
PAPER: "Welding Electrodes"	Dr. John W. Miller, Metallurgist,	Reid-Avery Company, Dundalk, Baltimore, Maryland

WEDNESDAY, OCTOBER 14 Afternoon Session — 2:00 P. M.	W. H. Crawford, Resident Manager Chairman of Meeting	Eaton Manufacturing Company, Massillon, Ohio

THE MORDICA MEMORIAL LECTURE

To Be Presented By

Louis H. Winkler,
Metallurgical Engineer,
Bethlehem Steel Company,
Bethlehem, Pa.

"STEEL AND WIRE"

WEDNESDAY, OCTOBER 14
Evening — 7:30 P. M.

ANNUAL DINNER — STAG SMOKER — THE HOTEL CARTER

THURSDAY, OCTOBER 15 Morning Session — 9:45 A. M.	A. E. Glen, Assistant General Mgr. of Sales Chairman of Meeting	Carboloy Company, Inc., Detroit, Michigan
PAPER: "Submerged Combustion Takes Its Place in the War Industries"	Walter G. See, Sales & Service Manager	Submerged Combustion Co. of America, Hammond, Indiana
PAPER: "Electric Patenting of Wire"	John P. Zur. Metallurgical Engineer	Trauwood Engineering Company, Cleveland, Ohio

THURSDAY, OCTOBER 15
Afternoon Session — 1:30 P. M.

PLANT INSPECTION — ELECTRIC PATENTING OF WIRE

THURSDAY EVENING
OCTOBER 15 — 7:00 P. M.

AMERICAN SOCIETY FOR METALS DINNER

(Tickets for this dinner may be obtained at The Wire Association Registration Desk)

THE WIRE ASSOCIATION MEDAL AWARDS

For the Most Meritorious Paper on Wire Manufacture or Fabrication During the Year.

MEDAL AWARDS

1934 — EDWARD J. P. FISHER
Metallurgist, Keystone Steel & Wire Co., Peoria, Ill.
Title of Paper: "COLD DRAWN STEEL SPRING WIRE"

1935 — BENJAMIN LEWIS McCARTHY
Metallurgist, Wickwire Spencer Steel Co., Buffalo, N. Y.
Title of Paper: "GRAIN SIZE AND ITS INFLUENCE ON THE MANUFACTURE OF STEEL WIRE"

1936 — ROBERT NOTVEST
Chief Engineer, Welding Division, J. D. Adams Mfg. Co., Indianapolis, Indiana
Title of Paper:
"STEEL FOR ARC WELDING ELECTRODES"

1937 — BENJAMIN LEWIS McCARTHY
Chief Metallurgist, Wickwire Spencer Steel Co., Buffalo, N.Y.
Title of Paper:
"ABNORMAL GRAIN GROWTH AND THE ANNEALING OF LOW CARBON STEEL WIRE"

1938 — WALTER R. BLOXDORF
Metallurgist, The MacWhyte Co., Kenosha, Wis.
Title of Paper: "WIRE ROPE"

1939 — STANLEY P. WATKINS
Manager, Sales Development, Rustless Iron and Steel Corp., Baltimore, Maryland
Title of Paper:
"THE MANUFACTURE AND USE OF STAINLESS STEEL WIRE"

1940 — ROBERT W. SANDELIN
Metallurgist, Atlantic Steel Company, Atlanta, Georgia
Title of Paper:
"GALVANIZING CHARACTERISTICS OF DIFFERENT TYPES OF STEEL"

1941 — CARLETON W. GARRETT
Wire Mill Metallurgist, Jones & Laughlin Steel Corp. Aliquippa, Pennsylvania
Title of Paper:
"A BRIEF DISCUSSION ON THE MANUFACTURE OF STEEL FOR ARC WELDING ELECTRODES"

HONORABLE MENTIONS

1935 — L. D. SEYMOUR
Metallurgist, Rod and Wire Dept., Youngstown Sheet & Tube Co., Youngstown, Ohio
Title of Paper: "COLD HEADING WIRE"

1935 — R. A. SCHATZEL
Superintendent, General Research Laboratories, General Cable Corp., Rome, N. Y.
Title of Paper: "HARD AND SOFT COPPER WIRE"

1936 — BENJAMIN LEWIS McCARTHY
Metallurgist, Wickwire Spencer Steel Co., Buffalo, N. Y.
Title of Paper:
"PLASTIC DEFORMATION IN WIRE DRAWING"

1937 — ROBERT W. SANDELIN
Metallurgist, Atlantic Steel Co., Atlanta, Ga.
Title of Paper:
"A METALLURGICAL STUDY OF THE FACTORS AFFECTING THE QUALITY OF GALVANIZING"

1937 — ALLAN B. DOVE
Chemical Engineer, Canada Works, The Steel Company of Canada, Ltd., Hamilton, Ont., Canada.
Title of Paper:
"A. C. ELECTRO PICKLING—A BETTER METHOD OF PICKLING"

1938 — RODMAN R. TATNALL
Metallurgist, Morgan Works, Wickwire Spencer Steel Co., Worcester, Massachusetts
Title of Paper: "RESILIENCE OF SPRINGS"

1938 — JOSEPH A. DOYLE
Vice President, W. S. Rockwell Co., New York, N. Y.
Title of Paper: "HEATING COPPER WIRE BARS"

1940 — H. BLOUNT and J. D. WILTRAKIS
Mfg. Engineer, Point Breeze Works, Engineer, Kearny Works, Western Electric Company
Title of Paper:
"DESIGN AND OPERATION OF A NEW COPPER WIRE DRAWING PLANT"

1941 — RODMAN R. TATNALL
Metallurgist, Morgan Works, Wickwire Spencer Steel Co., Worcester, Massachusetts
Title of Paper: "TIME, TEMPERATURE AND SIZE IN THE HEATING OF STEEL WIRE"

ANNUAL MEDAL AWARD OF THE WIRE ASSOCIATION

FOR THE MOST MERITORIOUS PAPER ON WIRE MANUFACTURE OR FABRICATION DURING THE YEAR — BY A MEMBER OF THE WIRE ASSOCIATION —

ALL members of the Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association Convention.

✦ ✦ ✦

AN annual medal will be awarded in each of the two major divisions of the activities of the Association, to the papers coming nearest to the requirement set forth above.

✦ ✦ ✦

CONSIDERATION for the Medal Awards is not limited to the papers presented at the Annual Meeting, but is given to all papers submitted by members and published in "WIRE & WIRE PRODUCTS" during the year.

✦ ✦ ✦

ADDITIONAL information may be obtained by addressing:

✦ ✦ ✦

SELECTION of papers to be presented at the Annual Convention rests in the hands of the Joint Programme Committee and the Board of Directors of the Wire Association.

✦ ✦ ✦

ALL papers submitted become the property of the Wire Association and the Board of Directors constitutes the Committee on Awards.

✦ ✦ ✦

RICHARD E. BROWN, SECRETARY, THE WIRE ASSOCIATION

STAMFORD TRUST CO. BLDG. STAMFORD, CONNECTICUT

Government Wire Production Information

Where Wartime Steel is Used

THE Office of War Information recently stated that more than 75% of the Nation's steel output of 5,300,000 tons a month is now going into direct war use and the remainder into such essential industries as railroads, machinery manufacture, and the like.

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THE report also states that 80% of our steel is being delivered on ratings of A-1-a or higher.

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THE 5,300,000 tons a month currently being delivered represents finished steel products, a reduction of approximately 30 per cent from ingot production of more than 7,000,000 tons. In terms of plates and shapes, sheets, bars, pipe, wire, rails, and the like, the United States this year will turn out about 62 million tons. This is slightly more than 70 per cent of the 86 million ingot tons the nation is expected to produce. The remaining 30 per cent goes back into the furnaces in the form of scrap.

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THIS is the way the nation's ingot production has grown since 1939:

1939	52,798,714 net tons	
1940	66,982,686 " "	
1941	82,927,557 " "	
1942	86,000,000 " "	(estimated)

✦ ✦ ✦

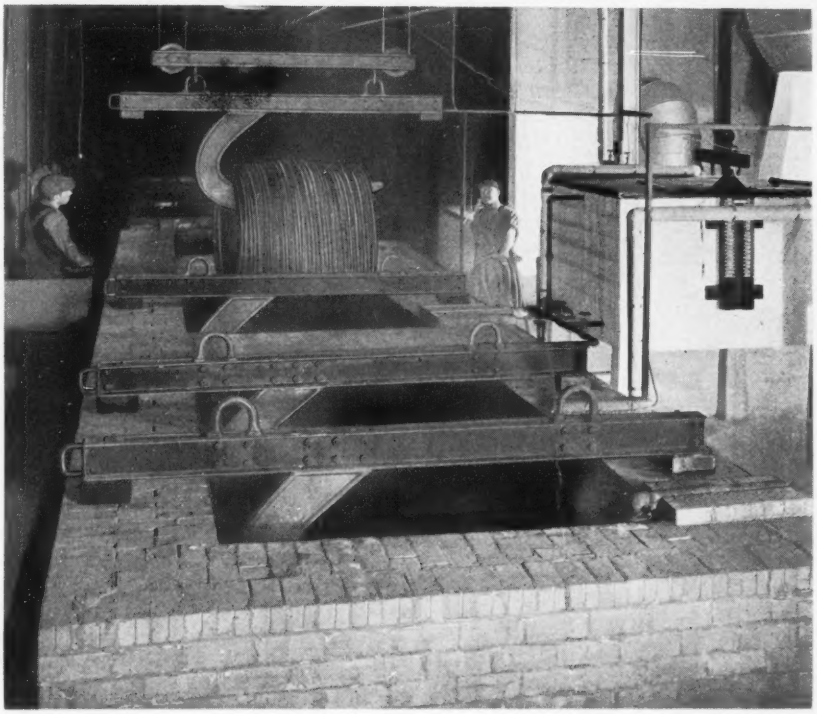
TO make this increased production possible, steel - making capacity, that is, rated capacity as distinct from actual production, has been stepped up correspondingly. At the end of 1939, it was 81 million tons; 1940, 84 million; 1941 88 million. By the end of 1942 capacity probably will reach 93 million tons and by mid-1943, 98 millions.

✦ ✦ ✦

CURRENT production is far ahead of the best the Axis nations can do, including the German-controlled countries of Europe. Axis steel production was approximately 74 million ingot tons in 1941. The United Nations that

(*Please turn to Page 594*)

9 Years In Operation and Not One Cent Spent for Maintenance



Three Section Wire Pickling Tank, 35' long x 6' wide x 7' deep, Reinforced Concrete Shell Design

The Owners inform us this installation is today in perfect condition and expect many more years of trouble-free operation.

BASOLIT acid tanks are designed for this kind of service. They are also easy and economical to install.

BASOLIT acid proof floors, pits, sewers, trenches, etc. built in accordance with NUKEM Construction will give the same durable performance.

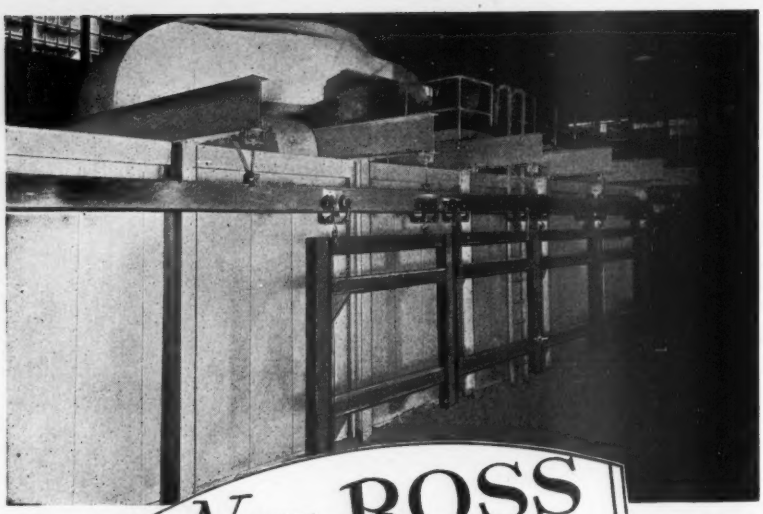
Send us your problems regardless of their nature and we will give you a Guaranteed Recommendation.

NO-CHARGE OR OBLIGATION WHATSOEVER

NUKEM PRODUCTS CORPORATION

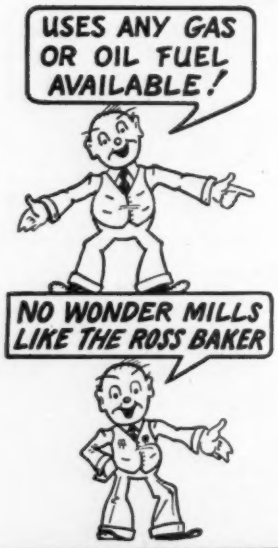
BUFFALO, N. Y.

NEW YORK — PITTSBURGH — STEUBENVILLE — DETROIT — CHICAGO — KITCHENER, ONT.



New ROSS Wire Baker

SPEED UP the Baking of Wire and Rods



The Ross Wire and Rod Baker utilizes High Temperature Air that is entirely free from all products of combustion. The circulation of this clean heated air not only dries your product in much less time but prevents the rusting often caused by older methods of baking. It insures a soft smooth lime coat that lengthens the life of drawing dies.

Whether your requirements are for a new baker or the revamping of your present unit, write us for full particulars.

J. O. ROSS ENGINEERING CORPORATION

Main Office—350 MADISON AVENUE., New York, N. Y.

CHICAGO—201 North Wells Street DETROIT—12953 Greeley Avenue

ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

Government Wire Production Information

(*Continued from Page 593*)

same year controlled more than 65 per cent of the world's steel output.

✦ ✦ ✦

FIVE million tons of finished steel a month—where does it all go?

✦ ✦ ✦

INTO tanks: it takes about 38 tons of steel to make a medium tank and the United States is turning out a lot of them.

✦ ✦ ✦

INTO ships: present goals are for 8 million tons of dead-weight shipping this year and 16 million tons in 1943. Each cargo ship of the Liberty type now being made in quantity under direction of the Maritime Commission calls for approximately 4,500 tons of rough steel. Current production is around 70 ships a month.

✦ ✦ ✦

INTO planes: the big four-engine bombers take 15 tons of steel each. Fighter planes take 3½ tons and the other types fall in between.

✦ ✦ ✦

INTO guns: some of our anti-aircraft guns use up 14 tons of steel each; thousand of rifles, machine guns, anti-tank guns, and howitzers use steel, all the way up to the giant 16-inchers that take 576 tons of steel each.

✦ ✦ ✦

BUT that's just a part of the program, even of the direct military program. Thousands of additional tons of steel are going into naval ships, airplane carriers, submarines, destroyers; into peeps and jeeps and armored cars and trucks; into ammunition and aerial bombs (it takes half a ton of steel to make one of the 2,000-pound bombs the British have been dumping on German cities lately); into bayonets and helmets and radio equipment and the thousand and one odds and ends that accompany a modern army into war.

✦ ✦ ✦

THEN, of course, all over the country and in many parts of the world the United States is building barracks for soldiers and these buildings require some steel

even when they are built of wood. We devoted 55,000 tons of steel a month to nails in 1940. This year that is being upped to 72,000 tons.

✦ ✦ ✦

THEN there are hangars for airplanes and machine shops to repair them; submarine nets for harbors; steel for Dutch Harbor, steel for Eritrea, steel for the British, steel for the Russians, steel around the world.

✦ ✦ ✦

NEVERTHELESS, most of the steel has to stay at home. While production of automobiles and refrigerators and a thousand other articles for civilian use has been stopped, steel to build synthetic rubber plants, aviation gasoline plants, new chemical plants, new steel plants, new aluminum plants and new airplane plants, is necessary. There's a lot of steel in Willow Run. We have to continue to make machine tools and mining machinery and we cannot cut off completely the supplies of steel to the railroads, the oil industry, the farm machinery manufacturers, the utility companies and other essential industries. They are not getting much steel these days, but they do have to have some.

✦ ✦ ✦

THE problem of steel, then, is one of proper scheduling and planning in order to come out even on a well-balanced war production program, based upon the amount of material available. We want to make just as many tank guns as we need for tanks, no more and no less. And that goes for everything else.

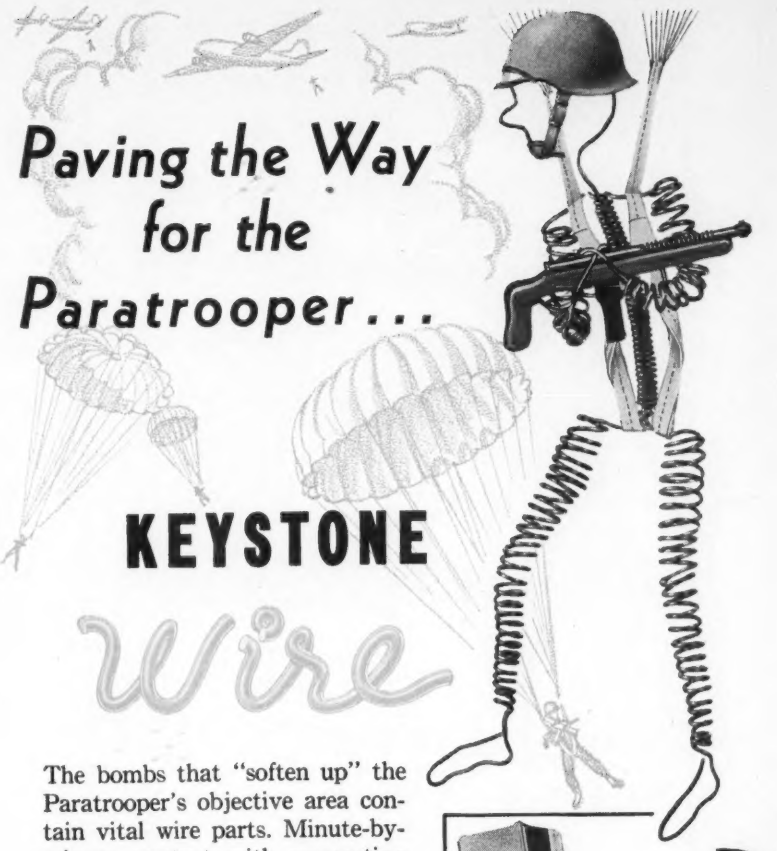
✦ ✦ ✦

SCHEDULING has been a tough problem so far. After Pearl Harbor we roared out to make all of everything we could. We stopped the production of civilian articles so there was plenty of steel available for every factory for a while. Now the time has come when the program must be brought into balance. It's just now that we must make our 5 million tons of production fit a demand of around 9 million tons a month.

✦ ✦ ✦

ONE important reason the program is out of balance today

(*Please turn to Page 596*)



Paving the Way for the Paratrooper...

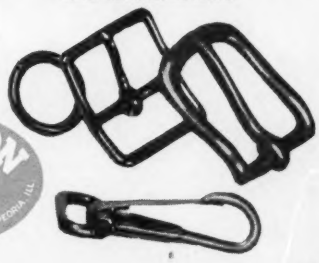
KEYSTONE Wire

The bombs that "soften up" the Paratrooper's objective area contain vital wire parts. Minute-by-minute contact with supporting forces depends on miles of field, radio and telephone wiring. The very plane which carries him contains almost innumerable construction items made of wire.

Thus do many thousands of WIRE products play their essential "fighting" roles — in planes, guns, tanks, ammunition — and far behind combat zones, in ships and services of supply.

Victory comes first. To that, the entire production facilities of Keystone are devoted. These facilities are backed by 53 years of wire making experience . . . to help assure the right wire for each job — in war as in peace.

FIELD COMMUNICATIONS



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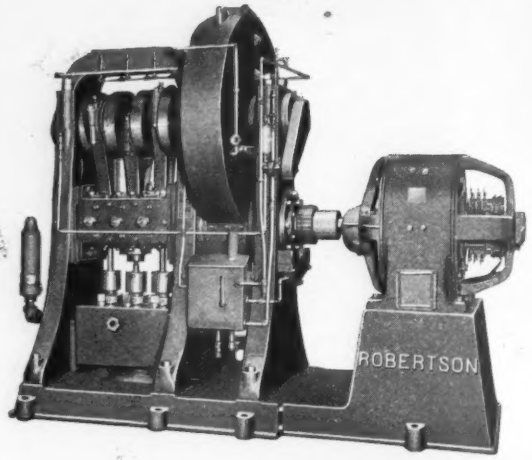
PEORIA, ILLINOIS

Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

THE ROBERTSON

HIGH PRESSURE HYDRAULIC PUMP



If your wartime production involves Hydraulic Pressure from 1000 to 6000 lbs. per sq. in.

— you can actually save *time* and *money* by installing a ROBERTSON High Pressure HYDRAULIC PUMP. For, while the price may be somewhat higher, you will be getting the finest pump money can buy — both in efficient, trouble-free performance and length of life. And here are the features which make it so:

1. Sight gauge showing the flow of oil delivered into gear case.
2. Filter for oil from oil feed pump.
3. Oil feed pump for gear-drive and all shaft bearings.
4. Timken roller bearings.
5. Enclosed flexible coupling.
6. Oil storage tank of large capacity.
7. Bronze bonnets on pump chamber—no rusting.
8. Solid forged steel pump block with removable valve seats.
9. Deep packing chamber to insure long life of hydraulic packings — easy to get at.
10. Spring-balanced hydraulic safety relief valve of sufficient capacity to take the full capacity of pump without undue increase in pressure.
11. Non-rust steel plungers, ground and polished.
12. All eccentric and main shaft bearings bronze-lined.
13. Sight feed oilers for all eccentric and main shaft bearings.
14. Herringbone gear-drive in cast-iron oil-tight case.

John Robertson Co. Inc.

125-137 WATER STREET, BROOKLYN, N. Y.

Designers and Builders of

All types of lead encasing equipment for rubber hose and electrical cable manufacturers.

Government Wire Production Information

(*Continued from Page 595*)

is that the resourcefulness of American industry, when sent to war, could not be foreseen. This country had had no experience in fabricating implements of war. We did not know what our production men could do until they got to doing it.

✦ ✦ ✦

TODAY our factories are turning out some parts faster than anyone dreamed it could be done a few months ago. Rifling a gun barrel is one of the most delicate machining tasks of all. It now is being done in one-thirtieth of the time it took a few months ago. It used to take more than six hours to counterbore 280 holes in the crankcase of an aircraft engine. It's being done now in 65 minutes. And so it goes.

✦ ✦ ✦

THE result is that we have a capacity to "chew up" steel faster than we can make it. Unfortunately, we cannot make the "chewing up" capacity the yardstick for war production. Steelmaking capacity has to be that yardstick because it cannot be increased as rapidly as can the plants which consume steel. That is why some plants operating on war contracts have had to slow down at times for lack of materials.

✦ ✦ ✦

ALSO in the picture is the fact that big steel users must receive a substantial quantity of the steel they consume some time in advance of its use. We are pouring steel into a vast industrial pipeline today that will not emerge as finished products for several months. This — which is also a scheduling problem — means that the quantity of steel being ordered today is the reflection of future production rather than current production.

✦ ✦ ✦

THE projected increases in steel output over our present high tonnage present a problem. The steel industry is operating currently at more than 97 per cent of capacity and has been over 90 per cent for two years. No more steel

can be turned out without new open hearth, Bessemer or electric furnaces in which to make it. These are huge, intricate affairs that consume large quantities of time, and steel, in the making. But that is just a part of the problem.

✦ ✦ ✦

WE must mine more iron ore, and build more ships to haul that ore from the Mesabi range in northern Minnesota down the Great Lakes to the steel mills. We must build more blast furnaces to produce the pig iron from which steel is made. We must produce more coke to use as fuel in the refining process. We must find more and more steel scrap, collect it, and get it to steel mills as rapidly as possible. All of these steps are necessary to keep our huge steel output operating at record levels.

✦ ✦ ✦

Special Unit Set Up

A SPECIAL unit from the copper branch of WPB has been set up in the offices of Copper Recovery Corporation, 200 Madison Avenue, New York, N. Y., to locate copper in the forms needed, and to redistribute it to war plants urgently requiring it because of unforeseen material shortages, plant breakdowns, receipt of new war orders, or other emergencies. In most of these emergencies, the war plant cannot wait for receipt of the needed shapes from its regular source of supply.

✦ ✦ ✦

AT present, emergency requests for copper in various forms are being received from war plants and the armed services at the rate of 500,000 pounds a day.

✦ ✦ ✦

Steel Mills Can Use AA-3 for Repair, Operating Supplies

RATINGS of AA-3 may be applied for maintenance, operating or repair supplies for iron and steel mills, the Director General for Operations announced August 10, in an amendment to Order P-68.

THIS rating applies to operating supplies consisting of iron or steel in any form appearing on Materials List No. 1, revised, of Form PD-25A. A-1-a ratings may be applied to nonferrous metals appearing on the list, or to fabricated metal parts. A-1-c ratings are granted for all other operating material.

✦ ✦ ✦

IN case of actual breakdown of a steel mill, whatever rating is necessary to obtain the needed parts may be assigned by the Director General.

✦ ✦ ✦

Steel Scrap Forms Improperly Executed

PD Forms 149, 150 and 151 are not being properly filed and executed. Negligence in filing these forms with the Bureau of Mines, Pittsburgh, Pa., is contrary to General Preference Order M-24 issued by the War Production Board.

(*Please turn to Page 614*)

Specialists **In Processing Machinery For The Welding Rod Manufacturing Industry**

★ WELDING ROD FEEDING MACHINES
★ EXTRUSION DIE HEADS
★ END BRUSHING MACHINE
★ MIXERS
★ FLUX COATING CENTER GAUGE
★ WELDING ROD EXTRUDING PRESSES
★ TAKE-AWAY CONVEYOR AND BELTS
★ CONVEYOR-TYPE ELECTRODE OVEN
★ SCALES
★ SLUG PRESSES
★ WIRE STRAIGHTENING AND CUTTING MACHINES

We maintain a complete Engineering Department, and are in a position to design and build any auxiliary equipment which you may need.

YOU ARE CORDIALLY INVITED TO INSPECT OUR NEW OFFICES AND PLANT, TOGETHER WITH ANY EQUIPMENT WE HAVE ON THE FLOOR DURING THE WEEK OF THE NATIONAL METAL EXPOSITION, OR AT ANY TIME YOU ARE IN CLEVELAND.

NOTE: We Are Only A Five-Minute Taxi Ride From The Exposition Hall.

MOSLO MACHINERY COMPANY

2443 PROSPECT AVENUE — CLEVELAND, OHIO

MAin 8864

Wire Association Membership List — 1942

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ANDERSON, ERNEST G., Chief Met.,
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ANJESKEY, A. F., Sales Mgr.,
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ATKINSON, L., Supt.,
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BAKER, DAVID, JR., Metallurgical Engr.,
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BARKER, L. B.,
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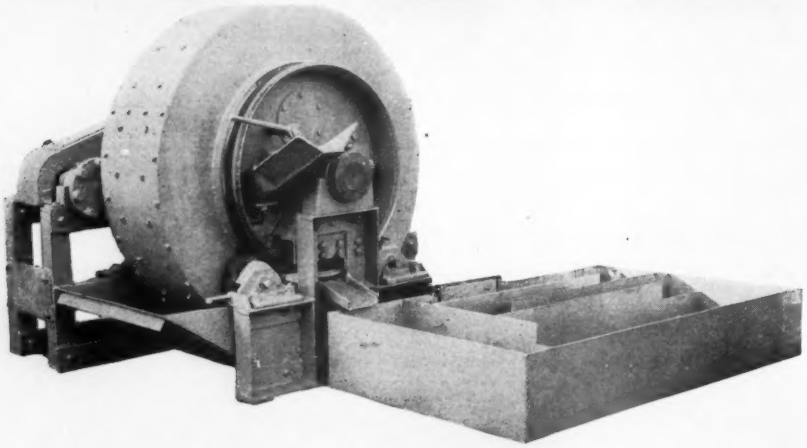
RECLAIM ALL LEAD – ZINC – TIN
From POT and PAN BLANKET



A COMPLETE CONCENTRATING PLANT

Mills and Separates All Metal for Direct Re-melting, From Asbestos and Coal Blanket Skimmings

Save Scarce Metal for War and Make More Profits

Feed — 800 to 1200 Pounds Per Hour
Power — 3 H. P. Direct "V" Belt Drive
Floor Space — 8'-1½"x9'-1½" Plus Space for Operator
Construction — All Steel

All Metal Milled Free Remains in Drum, the Waste Flows Into the Settling Tank. Water Recirculates Through the Mill.

Write for OPA Price — It's Low

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BLUM, AL, Asst. Supt. Wire Dept.,
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Cable Reel Dept.,
Stevens Metal Products Co.,
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Pittsburgh Steel Company,
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American Optical Co.,
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BROWN, HUGH E., Director of Research,
The W. S. Tyler Company,
Cleveland, Ohio.
BROWN, RICHARD E., Publisher,
WIRE & WIRE PRODUCTS,
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Syncro Machine Co., Rahway, N. J.
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Geneva, Ill.
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General Cable Corp.,
Los Angeles, Calif.
BULLOCK, COL. FRANK W., Signal Corps,
Office of the Chief Signal Officer, War Dept.,
Washington, D. C.
BURLEY, H. B., Pres. & Treas.,
Boston Insulated Wire & Cable Co.,
Dorchester, Mass.
BURNS, J. L.,
Republic Steel Corp.,
South Chicago, Ill.
BUSH, COL. GEO. P.,
Office of the Chief Signal Officer,
Washington, D. C.
BUTLER, VICTOR H., Met.,
Baxters (Bolts, Screws & Rivets) Ltd.,
Parade Wks., Birmingham, England.
CALLAGHAN, JOHN C., Wks. Mgr.,
Canada Wks., Steel Co. of Canada, Ltd.,
Hamilton, Ontario, Canada.
CARNAHAN, H. B., Asst. Wks. Mgr.,
Canada Wire & Cable Co, Ltd., & Standard
Underground Cable Co. of Canada, Ltd.,
Toronto, Ontario, Canada.
CARTER, BEN., Managing Director,
B. & F. Carter & Co., Ltd.,
Albion Wks., Bolton, Lancs., England.
CASSIDY, LEVI M.,
Wickwire Spencer Steel Co.,
Buffalo, N. Y.
CASTLE, D. E., Chief Clerk of Acct.,
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Sterling, Ill.
CHAMBRE, LOUIS, Vice President,
Balloffet Dies & Nozzle Co., Inc.,
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Page Steel & Wire Div.,
American Chain & Cable Co., Inc.,
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CLARK, E. W., Mechanical Engr.,
Wire & Cable Section,
General Electric Company, Schenectady, N. Y.
CLARK, HERBERT B.,
Vascoloy-Ramet Corporation,
North Chicago, Ill.
CLEMENTS, W. C., Asst. Met. Engr.,
Bethlehem Steel Co.,
Bethlehem, Pa.
CLIFFORD, RALPH K., Vice Pres.,
Continental Steel Corp.,
Kokomo, Indiana.
COCHRAN, ISAAC GEORGE, Supt. Wire Mill,
Laclede Steel Co.,
Alton, Ill.
COLEMAN, WM. H., President,
All State Wire Products,
Cleveland, Ohio.
CONDON, E. J., Master Mechanic,
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Muncie, Indiana.
COOCH, LOUIS S., Met.,
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North Tonawanda, N. Y.
COOK, JOHN,
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New York, N. Y.
COPPICK, JOHN C., Mill Supt.,
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Wm. Riddell, Cousland & Co., Ltd.,
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CRANE, CLYDE C., Met. Wire Div.,
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CRAPO, FRED M., President,
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CRAWFORD, W. H., Resident Mgr.,
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Eaton Manufacturing Co.,
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CREWE, L. C., Asst. Supt. Rod & Wire Mill,
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Alloy Metal Wire Co.,
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CRUM, E. JEFFERSON, Foreman,
Rod & Wire Div.,
Bethlehem Steel Company,
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CUNY, COL. C. D., Signal Corps,
c/o War Department, U. S. Army,
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DARRAH, W. A., President,
Continental Industrial Engineers, Inc.,
Chicago, Ill.
DAVIS, BENJAMIN H., Sales Engr.,
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DAVIS, K. H., President,
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DAVIS, RALPH L., President,
R. L. Davis Electric Company,
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DAY, JAMES, Director,
James Day (Machinery) Ltd.,
The Grange, Whetstone nr. Leicester, England.
DeKLYN, JOHN H., Supt.,
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DERN, EMIL, Secretary,
Kelly Wire Die Corporation,
New York, N. Y.
DesCOMBES, L. E., Supv., Wire & Spring Oprs.,
International Harvester Company,
Rock Falls Wks., Rock Falls, Ill.
DILLON, W. M., Asst. Secy.,
Northwestern Steel & Wire Company,
Sterling, Ill.
DIMLING, PAUL E., Firthaloy Repr.,
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DONACHIE, MATTHEW J.,
Beryllium Corp. of Penna.,
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(*Please turn to Page 600*)

AUTOMATIC
STRAIGHTENING and CUTTING MACHINERY
with a
FLYING SHEAR

★ ★

For all Kinds of Material —
WIRE, ROD and SHEET METAL

★ ★

THE HALLDEN MACHINE COMPANY
THOMASTON, CONN.

Wire Association Membership List — 1942

(*Continued from Page 599*)

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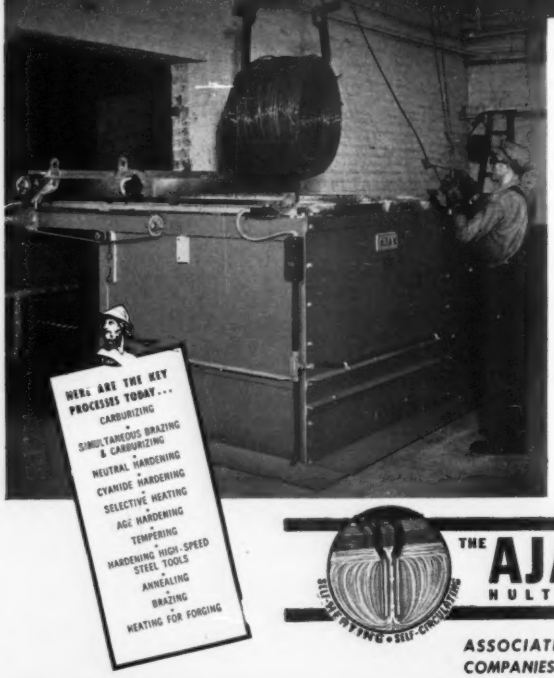

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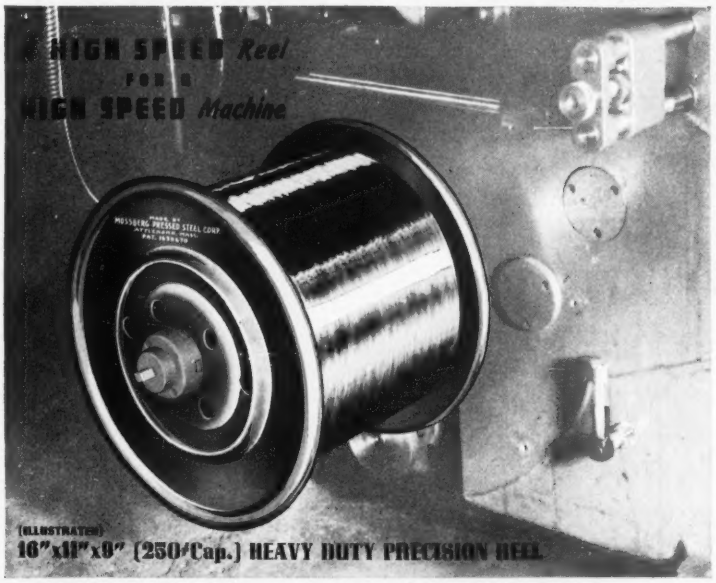

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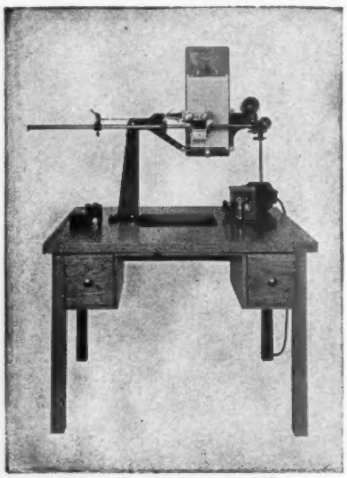
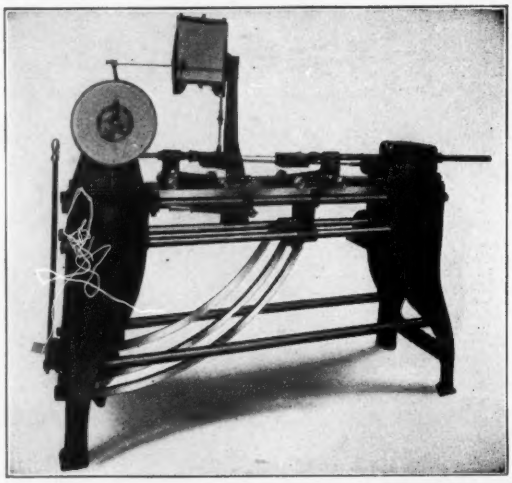


Model IP-2
Maximum capacity
2 pounds



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(Please turn to Page 604)

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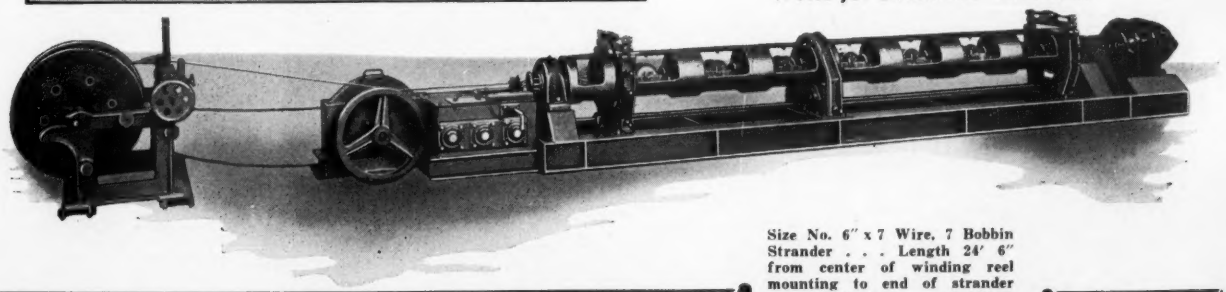

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UNIQUE

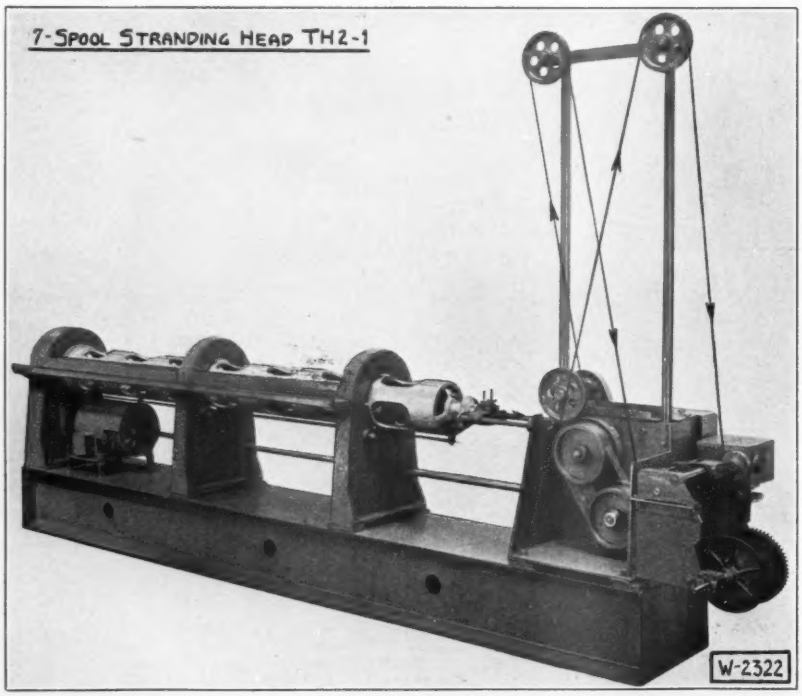
Wire Association Membership List — 1942

(Continued from Page 603)

ORR, C. E., Electrical Engr.,
Synero Machine Co.,
Rahway, N. J.
PALMER, W. J., Works Mgr.,
Phelps Dodge Copper Products Corp.,
Bayway, N. J.
PARKIN, WILLIAM M., President,
Wm. M. Parkin Co.,
Pittsburgh, Pa.
PAULEY, RALPH H., Pres. & Treas.,
Pittsburgh Tool Steel Wire Co.,
Monaca, Pa.
PEARSON, O. G., Wire Mill Supt.,
Continental Steel Corp.,
Kokomo, Ind.
PEIRCE, E. H., Supt., Wire & Rod Dept.,
Wheeling Steel Corp.,
Portsmouth, Ohio.
PENA, PLATON GOMEZ, Engr.,
Cia. Manufacturera de Artefactos Electricos,
S. de R. L., Irapauto, GTO, Mexico.
PETERSON, A. H., President,
Precision Spring Products Corp.,
Detroit, Mich.
PETERSON, R. O., Development Engr.,
Osborn Manufacturing Co.,
Detroit, Mich.
PETIX, JOSEPH M., Sales Engr.,
J. O. Ross Engr. Corp.,
New York, N. Y.
PETTERSON, A. R., Vice President,
Thomson-Judd Wire Machinery Co.,
Lynn, Mass.
PHIPARD, HARVEY F., JR., Pur. Agt.
Continental Screw Co.,
New Bedford, Mass.
POOLE, E. J., JR., V. P. Chg. Mfg.,
Carpenter Steel Co.,
Reading, Pa.
POTTER, EARL R., Supt.,
Standard Wire Div.,
The California Wire Cloth Corp.,
South San Francisco, Calif.
PRESTON, R. R., Sales Engr.,
Carboloy Co., Inc.,
Pittsburgh, Pa.
RANDALL, H. L., President,
Riverside Metal Company,
Riverside, N. J.
RAUSCH, R., Supt.,
State Wire & Cable Co.,
Jamaica, L. I., N. Y.
REA, V. F., President,
Rea Magnet Wire Company,
Fort Wayne, Ind.
REEDER, A. M., Met. Engr.,
Jones & Laughlin Steel Corp.,
Pittsburgh, Pa.
RENFER, E. A., Mgr., Sycamore Mill,
Anaconda Wire & Cable Co.,
Sycamore, Ill.
RENNELL, H. H., Sec'y-Treas.,
The C. O. Jelliff Mfg. Corp.,
Southport, Conn.
RICHARDS, G. WHITFIELD,
Philadelphia, Pa.
RICHARDS, JOHN H., JR., Chem. Engr.,
Apex Alkali Products Co.,
Manayunk, Pa.
RICHARDS, WALTER A., Pres.,
Micro Products Co.,
Chicago, Ill.
RIGBY, HAROLD W., Director,
Thomas Wood & Son (Heckmondwike) Ltd.,
Heckmondwike, Yorks., England.
RIGBY, JOHN, Director,
John Rigby & Sons, Ltd.,
Manchester, England.
RITCHEY, J. P., Supt.,
Angell Nail & Chaplet Co.,
Cleveland, Ohio.
ROBERTS, C. O., Plant Supt.,
Belden Mfg. Co.,
Chicago, Ill.
ROEMER, HENRY A., JR.,
Mgr. of Sales, Rod & Wire Prod.,
Pittsburgh Steel Co.,
Pittsburgh, Pa.
ROLLANS, DEAN, V. P. Chg. Sales,
Wickwire Spencer Steel Co.,
New York, N. Y.
ROLLE, CARL, Mech. Engr.,
International Nickel Co., Inc.,
New York, N. Y.
ROLLE, SIDNEY,
Vice Pres., Amco Magnesium Corp. and
Asst. Mgr., Scomet Engineering Co.,
New York, N. Y.
ROMAN, H. E., Wire Mill Supt.,
Northwestern Steel & Wire Co.,
Sterling, Ill.
ROTH, EUGENE, Eastern Dist. Sales Mgr.,
Vascoloy-Ramet Corp.,
New York, N. Y.
ROTH, RALPH B., Pur. Agt.,
Ludlow Saylor Wire Co.,
St. Louis, Mo.
ROWLAND, W. A., Wks. Mgr., Swansea Wks.,
The Steel Co. of Canada, Ltd.,
Swansea, Ontario, Canada.
ROYLE, CHAS. J., Vice Pres.,
Hudson Wire Co.,
Ossining, N. Y.
RUSCH, E. W., Pres.,
Rusch Wire Die Corp.,
New York, N. Y.
RYAN, L. A., Asst. to Pres.,
Fiske Brothers Refining Co.,
Newark, N. J.
RYLANDS, G. K., Gen. Mgr.,
Rylands Brothers, Ltd.,
Warrington, England.
RYLEY, A. ST. C., Gen. Mgr.,
Canadian Steel Corp., Ltd.,
Walkerville, Ontario, Canada.
SAFFORD, HENRY W., Comptroller,
Spencer Wire Co.,
Wire Village, Spencer, Mass.
SALAZAR, EUGENIO, Engr.,
Corporacion de Fomento de la Produccion,
Santiago, Chile, S. A.
SAMUEL, M., Mech. Engr., M.E.I.C.,
Empire Engineering Co.,
Toronto, Ontario, Canada.
SCHMIDT, R. H., Supt. Wire Mill, Plant #2,
Eaton Mfg. Co.,
Massillon, Ohio.
SCHUELER, JULIAN L., Gen. Supt.,
Continental Steel Corp.,
Kokomo, Ind.
SCHULTZ, W. J., Ch. Engr.,
Firth-Sterling Steel Co.,
McKeesport, Pa.
SEAL, PAUL W., Plant Supt.,
Central Cable Corp.,
Jersey Shore, Pa.
SEBURN, WM. A.,
Portsmouth, Ohio.
SEE, THEO. S., Vice Pres.,
LaSalle Steel Co.,
Hammond, Ind.
SEE, WALTER GEORGE, Sales & Service Mgr.,
Submerged Combustion Co. of America,
Hammond, Ind.
SEIFERT, CHARLES G., Sec'y & Supt.,
La Consolidada, S. A., Mexico City, D. F.
SEYMOUR, LeROY D., Asst. Wks. Mgr.,
Canada Wks., The Steel Co. of Canada, Ltd.,
Hamilton, Ontario, Canada.

THE WATSON MACHINE COMPANY
PATERSON, NEW JERSEY, U.S.A.

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY



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9. TUNGSTEN - CARBIDE GUIDES
10. RIGHT & LEFT HAND ASSEMBLY (RIGHT HAND SHOWN)

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Dewey & Almy Chemical Co.,
Cambridge B., Mass.
SHEARER, COL. A. M.,
c/o War Department,
Washington, D. C.
SHEARER, ROBERT G., Wire Sales Dept.,
Jones & Laughlin Steel Corp.,
Pittsburgh, Pa.
SHERMAN, WALDO L., Sec'y-Treas.,
John Robertson Co., Inc.,
Brooklyn, N. Y.
SHILLING, J. H., Supt. Wire Div.,
Youngstown Sheet & Tube Co.,
Youngstown, Ohio.
SHILLING, WM. A., Sales Engr.,
Carboloy Co., Inc.,
Worcester, Mass.
SHORT, CHAS. P., Sales Repr.,
Steel Co. of Canada, Ltd.,
Hamilton, Ontario, Canada.
SHUBROOKS, G. E., Ch. Chemist,
Hamilton Watch Co.,
Lancaster, Pa.
SICKELS, EDMUND D., Adv. Mgr.,
"WIRE & WIRE PRODUCTS",
Stamford, Conn.
SIMMONS, R. S., Gen. Met.,
Keystone Steel & Wire Co.,
Peoria, Ill.
SIMPSON, COL. C. M., JR.,
c/o War Department,
Washington, D. C.
SINGH, SARDAH BALDEV, Managing Dir.,
Indian Steel & Wire Products Ltd., E.I.R. Wks.,
P. O., Tatanagar, B. N. R., India.
SKEKEL, ALEX, Gen. Foreman,
Wire Drawing Dept.,
Northwestern Steel & Wire Co.,
Sterling, Ill.
SLIFKA, M., Pur. Agt.,
Parker-Kalon Corp.,
New York, N. Y.
SMITH, C. J. S.,
Smith Brothers,
Birmingham 1, England.
SMITH, E., Production Supv.,
John A. Roebling's Sons Co.,
Trenton, N. J.
SMITH, JAMES A., Asst. Gen. Supt.,
Copperweld Steel Co.,
Glassport, Pa.
SMITH, J. GODFREY, Pres.,
Federal Wire & Cable Co., Ltd.,
Guelph, Ontario, Canada.
SMITH, VAN DORN C., Sales Dept.,
Oakite Products, Inc.,
New York, N. Y.
SMITH, W. M.,
Wickwire Spencer Steel Co.,
Chicago, Ill.
SOMERS, J. L., Vice Pres.,
Texas Nail & Wire Co.,
Galveston, Texas.
SOMERVILLE, W. E., Pres.,
W. E. Somerville Co.,
Coal City, Ill.
SOMMER, D. P., Vice Pres. & Gen. Supt.,
Keystone Steel & Wire Co.,
Peoria, Ill.
SOMMER, LESTER B., Asst. to Pres.,
Mid-States Steel & Wire Co.,
Crawfordsville, Ind.
SPARGO, WM.,
Spargo Wire Co.,
Rome, N. Y.
SPEAR, EMERSON, Vice Pres.,
Pacific Wire Rope Co.,
Los Angeles, Calif.
SPELLMAN, R. W., Dist. Repr.,
Vascoloy Ramet Corp.,
West Hartford, Conn.
SPOWERS, LIEUT. COMMANDER, W. H., JR.,
Bureau of Ships, Navy Dept.,
Washington, D. C.
SPRUANCE, F. P., Vice Pres.,
American Chemical Paint Co.,
Ambler, Pa.
STEELE, R. J., Ch. Engr., Firthaloy Div.,
Firth-Sterling Steel Co.,
McKeesport, Pa.
STEVICK, R. S., Wks. Mgr.,
Firth-Sterling Steel Co.,
McKeesport, Pa.
STIER, GEO. G., Asst. Sales Mgr.,
Specialties Div., National Oil Products Co.,
Harrison, N. J.
STIRLING, A. B., Sec'y,
Greening Wire Co., Ltd., Britannia Wks.,
Warrington, England.
STRINGFELLOW, H. A.,
Principal Industrial Specialist,
War Production Board,
Boston, Mass.
STUMPF, GORDON A., Met., Research Dept.,
Timken Roller Bearing Co.,
No. Canton, Ohio.
SULLIVAN, F. W., Treas.,
Greif Brothers Cooperage Co.,
Cleveland, Ohio.
SULLIVAN, J. J.,
Pittsburgh, 16, Pa.
SWIFT, JOHN WM., Fabricating Supt.,
Aluminum Co. of Canada, Ltd.,
Shawinigan Falls, P. Q., Canada.
TATNALL, RODMAN R., Met. Engr.,
Morgan Wks., Wickwire Spencer Steel Co.,
Worcester, Mass.
THOLAND, NILS K. G.,
Ekstrand & Tholand, Inc.,
New York, N. Y.
THOMAS, EARLE H., Supt.,
Geo. W. Prentiss & Co.,
Holyoke, Mass.
THOMAS, J. E., Wire & Cable Engr.,
Canadian General Electric Co.,
Peterborough, Canada.
TIMBERLAKE, J. E., Wire Dept.,
Jones & Laughlin Steel Corp.,
Pittsburgh, Pa.
TIMMERMAN, E. D.,
The Steel Co. of Canada, Ltd.,
Montreal, P. Q., Canada.
TWIBLE, W. J., Wks. Mgr.,
Graham Nail & Wire Products, Ltd.,
Toronto, Ontario, Canada.
ULLMANN, LEO, Managing Director,
Chiswell Wire Co., Ltd.,
London, N. W. 11, England.
ULLRICH, FREDK. GEO., Gen. Mgr.,
N. Z. Fence & Gate Wks.,
Petone, New Zealand.
UNSWORTH, J. L., Asst. to Gen. Mgr. Sales,
John A. Roebling's Sons Co.,
Trenton, N. J.
VAN HOOK, CHARLES F.,
Mgr. Cable & Machinery Div. &
Ch. Engr., Watson Machine Co.,
Paterson, N. J.
VAUGHN, L. A., President,
Vaughn Machinery Co.,
Cuyahoga Falls, Ohio.
VIRDEN, C. L., Supt.,
Reid Avery Co.,
Dundalk, Baltimore, Md.
VOIGTLANDER, CURTIS, Supt. Wire Mills,
Union Wire Rope Corp.,
Kansas City, Mo.

(*Please turn to Page 606*)

SAVE ZINC

Save scarce metal and cut down waste in your hot galvanizing of wire and pipe by using

DEWALCO LIQUID BLANKET

★ PREVENTS FORMATION OF ZINC OXIDE

★ CUTS HEAT LOSSES

★ REDUCES DROSS

Successful use for more than a year has proved its worth. We don't claim it will produce the same results in every operation, but its record of achievement indicates that it may help you. Isn't it worth a serious trial to see what it will do for you? We'll gladly give you details.

SAVE ZINC — USE DEWALCO LIQUID BLANKET

DEWEY AND ALMY CHEMICAL COMPANY • CAMBRIDGE, MASS.

Wire Association Membership List — 1942

(*Continued from Page 605*)

WAARICH, O. W., General Supt.,
Pheoll Mfg. Co.,
Chicago, Ill.
WARD, C. T., Supt. Rod & Wire Mills,
Bethlehem Steel Co.,
Johnstown, Pa.
WARNER, CHARLES M., Supt. Wire Mill,
Scovill Mfg. Co.,
Waterbury, Conn.
WATKINS, STANLEY P., Mgr. Sales Development
Rustless Iron & Steel Corp.,
Baltimore, Md.
WEBB, E. H., President,
Webb Wire Works,
New Brunswick, N. J.
WEIKEL, G. A., Sales Engr.,
American Chemical Paint Co.,
Ambler, Pa.
WEILL-QUILLARDET, LEON, Consultant,
Jersey Steel & Wire Corp.,
New York, N. Y.
WEINMANN, E. R., Sales Mgr.,
Nukem Products Corp.,
New York, N. Y.
WELLINGS, COMMANDER A. J.,
U. S. N., Inspector of Naval Materiel,
Bethlehem, Pa.
WELSH, J. ALAN, Sales Engr., Firthaloy Div.,
Firth-Sterling Steel Co.,
McKeesport, Pa.
WERME, M. G., Plant Supt.,
Wickwire Spencer Steel Co.,
Clinton, Mass.
WERY, ALBERT G., Devl. Engr.,
General Cable Corp.,
Perth Amboy, N. J.
WESSEL, E., Vice Pres.,
Beall Tool Company,
East Alton, Ill.
WESTPHAL, FREDERICK A., Wks. Mgr.,
Sheffield Steel Corp. of Texas,
Houston, Texas.
WHEELER, G. CHAS., V. P. & Wks. Mgr.,
Callite Tungsten Corp.,
Union City, N. J.
WHITNEY, LESLIE C., Ch. Met.,
Copperweld Steel Co.,
Glassport, Pa.
WHITTEN, J. L., Sales Mgr.,
Lee Wilson Engineering Co.,
Cleveland, Ohio.
WHYTE, R. B., Gen. Supt.,
Macwhyte Company,
Kenosha, Wis.
WICKETT, J. A., Chem. Engr.,
Steel Co. of Canada, Ltd.,
Brantford, Ont., Canada.
WICKWIRE, CHESTER F., Vice Pres.,
Wickwire Brothers, Inc.,
Cortland, N. Y.
WILCOX, RICHARD L., Vice Pres.,
Waterbury Farrel Fdry. & Machine Co.,
Waterbury, Conn.
WILEY, WILLIAM G., Asst. to Gen. Sales Mgr.,
General Cable Corp.,
New York, N. Y.
WILLIAMS, JACK P.,
Syncro Machine Co.,
Chicago, Ill.
WILLIAMS, ROBERT C., Chief Chemist.
The Ironsides Company,
Columbus, Ohio.
WILSON, FRANK B., Gen. Wks. Mgr.,
Guest, Keen & Nettlefolds, Ltd., Atlas Wks.,
Darlaston, So. Staffs., England.
WILTRAKIS, JOSEPH E.,
Engr., Chg. Mach. Design, Mech. Lab & Molding,
Western Electric Company,
Kearny, N. J.
WIND, WILLIAM J., Sec'y,
Wilbur B. Driver Co.,
Newark, N. J.
WINKLER, L. H., Met. Engr.,
Bethlehem Steel Company,
Bethlehem, Pa.
WINTERSOHL, A. H., Supt., Firthaloy Div.,
Firth-Sterling Steel Co.,
McKeesport, Pa.
WOOD, MAURICE L.,
Chase Brass & Copper Co., Inc.,
Waterbury, Conn.
WOODFORD, F. M., Western Mgr.,
Tungsten Electric Corp.,
Cleveland, Ohio.
WOODHEAD, R. R., Research Engr.,
John A. Manning Paper Co., Inc.,
Troy, N. Y.
WOOLDRIDGE, J.,
Johnson & Phillips, Ltd., Victoria Wks.,
Charlton, London, S. E. 7, England.
YOUNG, LAFE, Gen. Supt.,
Laclede Steel Co.,
Alton, Ill.

For Information
Regarding
The Wire Association
Address
Richard E. Brown, Secretary
300 Main Street, Stamford, Conn.

ZAPP, A. R., Mgr., Firthaloy Div.,
Firth-Sterling Steel Co.,
McKeesport, Pa.
ZARAFU, HERMAN, Plant Engr.,
Circle Wire & Cable Co.,
Maspeth, L. I., N. Y.
ZOUCK, JOHN, Met. Supv., Rod & Wire Prod.,
Bethlehem Steel Co.,
Sparrows Point, Md.
ZUR, JOHN P., Metallurgical Engr.,
The Trauwood Engineering Co.,
Cleveland, Ohio.

✦ ✦ ✦

H. J. Leschen

HARRY J. LESCHEN, president of A. Leschen & Sons Rope Co., St. Louis, died suddenly, following an illness of a year. He was 63 years old. He became associated with the company in 1897, and was made president in 1914.

✦ ✦ ✦

MR. LESCHEN was president of the National Wire Rope and Strand Manufacturers' Association between 1933 and 1941 and a director of the Mississippi Valley Trust Co.

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1842—100 YEARS YOUNG—1942

PROVIDENCE, RHODE ISLAND

New Publication On Salt Bath Furnaces

HEAT Treatment in Ajax-Hultgren Electric Salt Bath Furnaces, a 20-page booklet, completely illustrated, showing modern installations of the immersed salt bath furnace with self-circulating, self-heating feature for all the key heat treating processes, including hardening high speed steel tools, carburizing, neutral hardening, heat treating aluminum alloys, selective heating, annealing, brazing, and armament applications. Operating principles are discussed, standard sizes are shown, together with variety of covers, pots, fume chimneys, as well as mechanized and manual types in general use, taken from more than a thousand installations.

✦ ✦ ✦

A COPY of this booklet may be obtained by addressing the Editor, WIRE & WIRE PRODUCTS.

✦ ✦ ✦

A New Hand-wiping Safety Solvent to Replace Naphtha, Gasoline, Kerosene

THE Research and Development Laboratory of **The Curran Corporation,** Malden, Massachusetts has developed a new hand-wiping safety solvent which is to be marketed as a safety replacement for naphtha, gasoline, and kerosene in removing cosmoline out of rifles issued to troops.

✦ ✦ ✦

ACCORDING to Mr. A. F. Curran, Research Director, the new solvent can be used as a superior naphtha substitute for grease cleaning and hand-wiping operations in Ordnance factories or shell plants, but has many industrial applications.

✦ ✦ ✦

THE solvent is to be marketed under its blanket trade-mark of, GUNK XP-92. It can be used as a Concentrate or diluted with water. In spite of its high solvency against mineral oil or dirt, it does not de-oil the skin, has no toxic vapors, no flash or fire point, and leaves an invisible rust preventative film so thin it cannot be detected.

Furnace Control Described

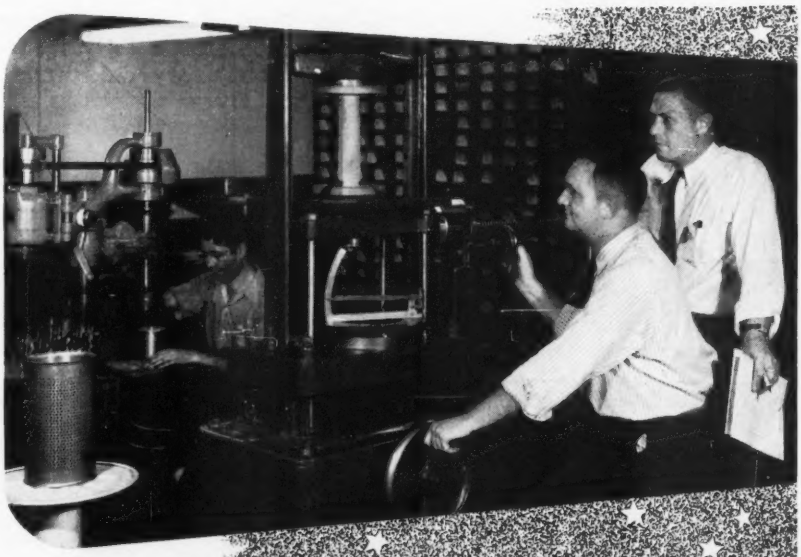
THE current issue of Wheelco Comments, house magazine of **Wheelco Instruments Company,** carries a feature on use of temperature control instruments in a pioneer midwestern heat treating plant.

✦ ✦ ✦

THE story brings out an unusual temperature control application on a multiple-burner furnace. It is designed to maintain even heat throughout the furnace regardless of heat losses at the doors. The installation, which is illustrated by a schematic drawing, may be applied to many types of furnaces and ovens.

✦ ✦ ✦

READERS of this magazine desiring a copy, may secure one by asking for Volume One, Number Seven of Wheelco Comments.



TO MAKE THEM BETTER
for the job you want done!

Today as always Hubbard research in spool and reel design and construction continues. While now concerning many products for use in the war, the information being gathered is adding to the fund of practical data that guide all Hubbard recommendations and production.

The constant application of those factors determined by Hubbard laboratory research is your assurance that Hubbard spools and reels will continue to be better for the job you want done.

HUBBARD SPOOL COMPANY
1624 CARROLL AVENUE | CHICAGO, ILLINOIS
Since 1912, manufacturers of wire drawing and annealing, and shipping spools and reels.

Take an Inventory Now

By Major Gen. Lewis B. Hershey, U.S.A.
Director of Selective Service

Industry advised to obtain replacements as Nation's military manpower needs increase. ✦ ✦ ✦ ✦ ✦

MANPOWER is a most important strategic material of today. Every employer should make a prompt inventory, appraisal and analysis of the manpower in his own plant as he would inventory his stock pile. In order to keep production going and at the same time furnish men for the armed forces, industry should now establish an orderly replacement program.

✦ ✦ ✦

IN order to secure temporary deferments for essential men while he is training women, young men, older men, men physically handicapped or those with a high degree of dependency, the employer should know the fundamental principles in the operation of his local Selective Service Board. Certain steps should now be taken by each employer. He should know how many men on his pay roll are between the ages of 20 and 45. He should investigate the classification of every one of those men. On the basis of such an inventory he should prepare to plan ahead and train men for replacement of those who must necessarily enter the armed forces if we are to have the sort of army which can win the war.

✦ ✦ ✦

Deferments Temporary

DEFERMENTS, granted so that employers may train women or men not liable to early induction, are temporary deferments; they cannot exceed six months and in many cases may be for only thirty, sixty or ninety days. The Army today has to train a bomber pilot within a period of eight months to operate a very technical machine with an instrument board which puzzles an expert. Why, therefore, should industry insist that it assume that it can take two or three years to train men for industrial tasks not nearly so complicated?

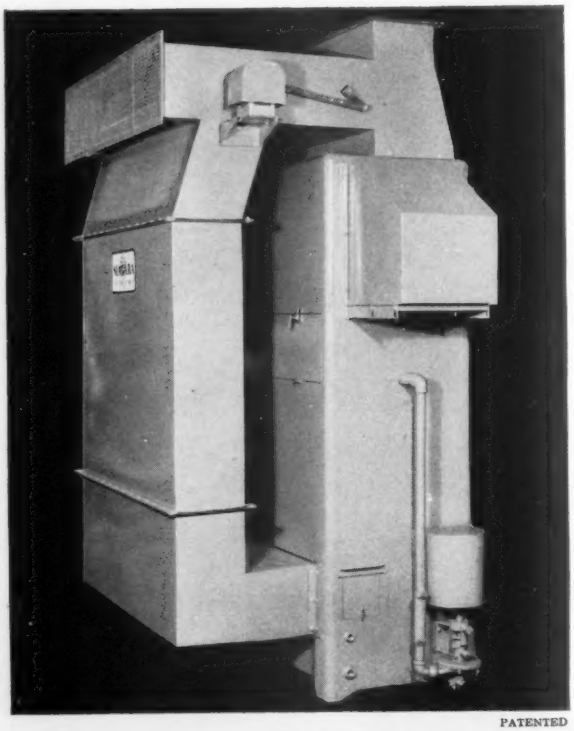
✦ ✦ ✦

THE fundamental purpose of every deferment of a registrant is to allow an employer to train a replacement. Only in a few rare instances can an employer expect to have these temporary deferments continued for more than the six months period. These are only in cases where an abnormally long period of training is required for a replacement and the eight months needed in which a bomber pilot can be turned out now, is something to remember in this connection.

✦ ✦ ✦

Employer's Responsibility

EMPLOYERS may seek the deferment of their necessary men with or without their consent. Here is how they go about it. On page 3 of the Selective Service Questionnaire (Form 40) which is sent to each registrant before he is



PATENTED

At the National Metal Congress... Booth C-428, North Exhibit Hall

HOW TO SAVE OVER 90% OF COOLING WATER

The NIAGARA AERO HEAT EXCHANGER solves the problem of water supply for cooling.

Users have cut water consumption and expense 95% in cooling wire drawing compounds and lubricants.

The NIAGARA AERO HEAT EXCHANGER provides continuous cooling by the evaporative method, using air as the cooling medium. In winter, air alone is used and heat is made available to bring compounds up to desired temperatures when necessary. Accurate temperature control and recovery of heat are valuable features.

See the Niagara Heat Exchanger at Booth C-428, National Metal Congress, or write for Bulletin 90.

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General Sales Office: 6 E. 45th St., New York City
37 W. Van Buren St., Chicago, Ill.
Fourth & Cherry Bldg., Seattle, Wash.
673 Ontario St., Buffalo, N. Y.
District Engineers in Principal Cities

NIAGARA INDUSTRIAL COOLING • HEATING • DRYING HUMIDIFYING • AIR ENGINEERING EQUIPMENT

classified is the following:

Instructions — If your employer believes that you are a necessary man in a necessary occupation, it is his duty to fill out Form 42A requesting your deferment. You may also attach to this page any further statement by yourself which you think the local board should consider in determining your classification. Such statement will then become a part of the questionnaire.

✦ ✦ ✦

THIS is on all the questionnaires distributed during the past six months. The fact that the Selective Service System now specifically mentions the filing of Form 42A as the manufacturers' duty is a clear indication of the Selective Service System view on the responsibility of each employer in this matter.

✦ ✦ ✦

THE employer can secure Form 42A at the local board and the local board will consider the employer's request when the form is properly filled out and signed.

✦ ✦ ✦

IF such request should be denied because the man, after consideration of the claims offered for him, is not considered to be indispensable to the company's operation, and is needed more in the armed services, the local board will advise the employer of its refusal of such an occupational deferment.

✦ ✦ ✦

THE local board does this by sending to the employer, at the same time it notifies the registrant of his classification, a Form 59.

✦ ✦ ✦

May Make Appeal

THERE are ten days after Form 59 is mailed by the local board to the employer during which the employer can appeal the registrant's case. The registrant will not be ordered to report for induction during this ten-day period.

✦ ✦ ✦

IN order to take an appeal the employer simply has to sign his name to Form 59 which he has received and return it to the local board; or in case the Form 59 is not received from the local board, any written request will have full value to make such an appeal effective. When Form 59 is returned by the employer the appeal procedure becomes automatic.

ALL necessary forms are available at the local board in the employer's immediate vicinity or at the office of the State Director of Selective Service.

✦ ✦ ✦

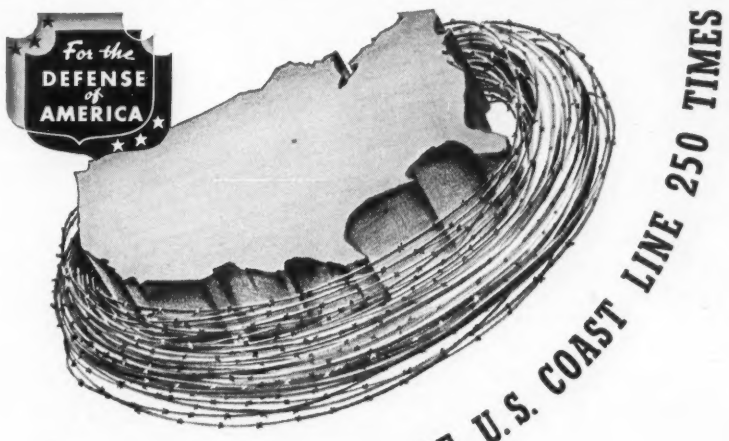
IF the local board and the appeal board deny the appeal for the occupational deferment of a key man, the employer may then bring the matter to the attention of the State Director at the State Selective Service Headquarters, with the request that the case be reopened or appealed by him to the President.

✦ ✦ ✦

Definite Duty

A DOUBLE duty rests upon the employer. He should personally know what his manpower situation is. He should not leave the job to a minor employee to decide who is necessary. The employer who delegates the task of filing a request for deferment to a clerk, the executive who does not make

(*Please turn to Page 610*)



YOU COULD CIRCLE THE U.S. COAST LINE 250 TIMES

• **RODINE** ***saved steel enough to make more than a million miles of barbed wire***

You could barricade the U. S. coast, circle the Equator more than 50 times, with barbed wire that could have been made from the steel saved by *Rodine* last year . . . steel which might have been lost by acid attack in pickling. *Rodine*, in the world's pickling baths, saves labor, acid, reduces brittleness, blistering, corrosion, eliminates formation and escape of acid fumes. For 20 years, ACP products have served by *saving* and *protecting* steel. Adequate stocks are available. Write for Bulletin No. 13.

CUPRODINE is the ACP granular material used in solution for producing a fine bright copper coating on steel by a simple immersion process. Ask for Bulletin No. 13-9.

RODINE Saves STEEL

AMERICAN CHEMICAL PAINT CO.

MAIN OFFICE AND WORKS
AMBLER . . . PENNA.

CHEMICALS ACP PROCESSES

DETROIT, MICH., 6335 Palmer Ave., E.
CANADIAN BRANCH
WALKERVILLE . . . ONT.

Take an Inventory Now

(*Continued from Page 609*)

a complete inventory of his whole plant today, is negligent. Likewise, the employer who files requests for deferment of men who can be replaced by women, or others, is keeping reinforcements out of an Army which is battling for us all. The employer engaged in essential war production who has been required to greatly expand his plant and who then fails to request deferment for his key men is also negligent.

A good rule to follow: Don't ask deferments for any men who can be replaced by training another individual not likely to be eligible soon for service in the armed forces.

✦ ✦ ✦

MAKE an inventory, request deferment for any man whose immediate going into the armed services would retard production of vital war material or other services essential to the war effort, or who is needed to maintain national health, safety and interest. Only when an employee is working in a critical occupation within an essential industry should a Form 42A be filed for his temporary occupational deferment.

✦ ✦ ✦

Make Replacements

YES, an inventory within a man's own plant is called for; also an appraisal and analysis of the manpower in the community. There is many a man over 45, or a man physically handicapped, or a woman who can do that job that the 23-year-old boy is doing who took a 12-weeks course at a learn-quick school.

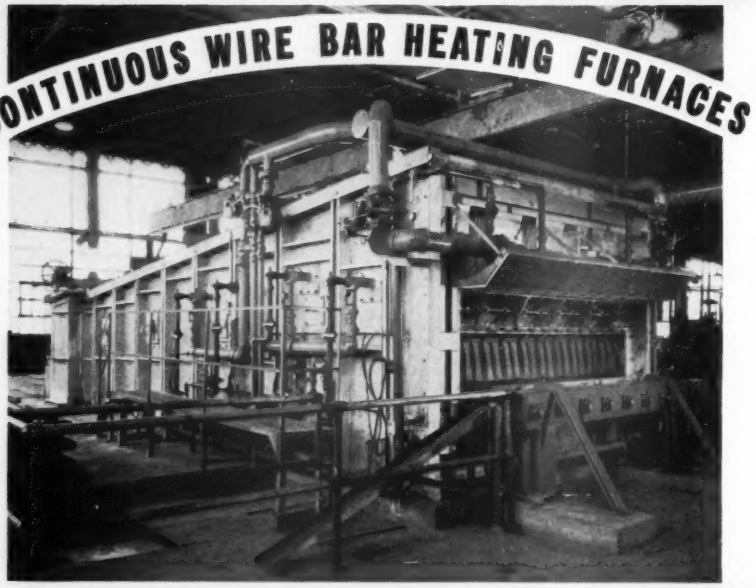
✦ ✦ ✦

THERE are not more than sixty million people in this country who are capable of effective productive effort. These men and women represent our total manpower available to win the war. They must do everything that must be done in a total war; maintain transportation, communications and utility systems, maintain public services, grow food for ourselves and our allies, mine the metals and produce the raw materials, fabricate and produce the amount of consumers goods necessary to maintain even a restricted national life and the supplies, weapons and munitions of war; also most of all they must provide the men who land on strange shores in far places, the men who carry the fight to the enemy on a multitude of far-flung frontiers. The rest of the population who mine raw materials and produce the weapons with which these men fight must be a self-disciplined team working in unity. The individual personal convenience, comfort or pleasure, or the convenience and ordinary leisurely replacement programs of the employer, will have to be given progressively less consideration as the war gets tougher and the casualty lists grow.

✦ ✦ ✦

WHEN we hear of the big armies we are going to raise, we must all remember that it takes at least five men or women to produce what they eat, use, fight with, and wear. With less than sixty million availables in this country, those figures are worth deep consideration.

ROCKWELL



MOST Copper Wire Bar Furnaces in this country, as well as the one with the largest capacity, are Rockwell built furnaces. This is because of our exceptionally wide experience in the development of this type of furnace.

The furnace shown above is of the double row type and has every refinement desirable in a modern continuous wire bar furnace. Furnace atmosphere is controlled so that bars are discharged with an extremely small amount of scale. The hydraulic pushing mechanism holds a sling full of bars ready for automatic placement in front of the pushing heads. The end discharge is ideal for operation in connection with live roller tables between the furnace and the mill. The wire bars are push button discharged. Built in capacities from 20,000 to 80,000 lbs. per hour.

We will be glad to consult with you on this, or any other type of heat treating equipment.

W. S. ROCKWELL CO. 50 CHURCH ST. NEW YORK

MANUFACTURERS OF ELECTRIC AND FUEL FIRED INDUSTRIAL FURNACES

Wallace T. Montague, Vice Pres., Norton Company

WALLACE T. MONTAGUE has been elected a vice president of Norton Company, Worcester, Mass., by the directors to fill one or two existing vacancies. Mr. Montague has charge of sales planning and development at Norton Company and has held the title of assistant vice president.

✦ ✦ ✦

AN alumnus of Worcester Polytechnic Institute of which he is now a trustee, Mr. Montague entered the Norton Company organization in 1912 and has devoted his talents chiefly to research and sales. He is a past president of the Worcester Chamber of Commerce, is chairman of the directors of the Grinding Wheel Manufacturers Association and vice president of the Special Refractories Association.

✦ ✦ ✦

Glycerine In Metal-Stripping Processes

IN these days when it is so necessary to recover metals for use in the war effort, it is pertinent that glycerine is frequently used in electrolytic metal-stripping processes.

✦ ✦ ✦

FOR example, to strip nickel from steel, **G. B. Hogaboom, Jr.** (Plating and Finishing Guidebook, Ed. 8) recommends the following solution:

Sulfuric acid	**3 gals.**
Glycerine	**2 oz.**
Water	**1 qt.**

This is to be used at room temperature; reverse current, 6 volts; using lead cathodes.

✦ ✦ ✦

ON occasion, gold deposits have to be stripped from silver. For this purpose, Chemical Engineer, **J. B. Kushner** (Prod. Finishing, Jan. 1942) suggests the following solution:

Concentrated hydrochloric acid	**4 oz.**
Glycerine	**1 fl. oz.**
Water	**1 gal.**

Use the solution cold; 6 volts; carbon cathodes. Avoid agitation since this tends to remove the thin protective film of silver chloride that forms on the base metal.

For Information
Regarding
The Wire Association
Address
Richard E. Brown, Secretary
300 Main Street, Stamford, Conn.

Customer Relationships

A CUSTOMER of the Metal Textile Corporation, Orange, New Jersey, who recently wrote for a scouring article made of wire received the following reply:

✦ ✦ ✦

"THANKS a lot for your interest in the Chore Girl, Goldylocks, etc. We are sorry we can't fill your order and trust the following explanation will suffice:

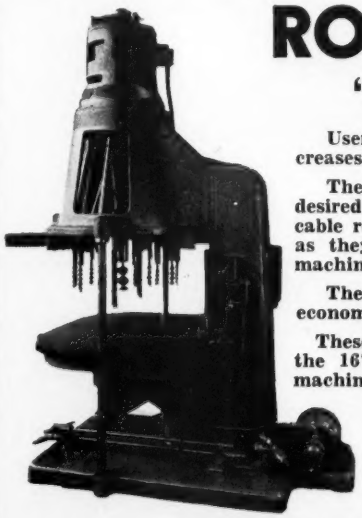
Thank you for your order, sir
For our efficient pot cleaner—
But our Chore Girl's gone abroad
To whack an Axis overlord.
All her copper pure and fine
Is making Allied bullets whine.
Be patient now, and at the store
You'll find them when we win the War!"

✦ ✦ ✦

IT appears to be a very clever and capable way of meeting a difficult situation.

ROOT CABLE REEL BORERS

"A Cable Reel Side Bored with Each Feed Stroke"



Root Style "AMH" 27" Round Hood Cable Reel Borer

Users of these borers report production increases up to 500%.

The adjustable spindles are centered for the desired pattern of holes. After that assembled cable reel sides will be accurately bored as fast as they can be handled into and out of the machine.

The hydraulic table feed assures unsurpassed economy of production and maintenance.

These borers are built in three sizes, the 16" diameter hood single column machine will handle cable reel sides up to 32", the 27" diameter hood single column machine up to 42" diameter and reels and the 40" diameter hood double column machine up to 84" capacity reel sides. Larger capacity machines built on order.

Let Root solve your cable reel boring problems. Write for information on cable reel boring machinery.

B. M. ROOT CO.
YORK, PENNA., U. S. A.

Root Style "AMRH" 40" Double Column Round Hood Cable Reel Borer.

A Review of Recent Wire Patents

No. 2,291,670, METHOD OF COATING WIRE AND THE LIKE, patented August 4, 1942 by Ralph M. Wiley, Midland, and Arthur J. Dubord, Jr., Battle Creek, Mich., assignors to The Dow Chemical Company, Midland. Mich., a corporation of Michigan.

The method is particularly applicable to coating wire with crystalline polymer, so as to orient the molecules in the polymer to provide a tough, flexible coating.

✦ ✦ ✦

No. 2,291,751, MANUFACTURE OF FASTENER DEVICES, patented August 4, 1942 by Louis Oestereicher, New York, N. Y., assignor to Parker-Kalon Corporation, New York, N. Y., a corporation of New York.

Self-locking nails are provided by a method including rolling a blank to form ribs thereon and simultaneously extruding a locking projection from the blank as it is rolled at points between the ribs, with a face at one side gradually extending upwardly from the base of the valley and an abrupt face at the other side providing a sharp shoulder extending transversely of the valley.

✦ ✦ ✦

No. 2,291,868, BEDSPRING CONSTRUCTION, patented August 4, 1942 by Stephen Blaha, Chicago, Ill., assignor to Superior Felt & Bedding Co., Chicago, Ill., a corporation of Delaware.

Wire coil springs are aligned in longitudinal and diagonal rows, and provided with tie wires extending in each diagonal direction, and crossing between cross rails and between the longitudinal rows of coil springs.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

✦ ✦ ✦

No. 2,291,869, BEDSPRING OR LIKE CONSTRUCTION, patented August 4, 1942 by Stephen J. Blaha, Chicago, Ill., assignor to Superior Felt & Bedding Co., Chicago, Ill., a corporation of Delaware.

✦ ✦ ✦

No. 2,291,922, MACHINE FOR FORMING WIRE COILS, patented August 4, 1942 by Kenneth F. Russell, Claremont, Calif., assignor to Herman H. Garner and Bess A. Garner, both of Claremont, Calif., as joint tenants.

Grooved guide wheels are provided to force the wire against the cylindrical mandrel at two points, so as to cause the wire to coil about the mandrel, a deflector being provided to force the wire away from the peripheral direction so as to bend the wire continuously to a pitch on the mandrel.

✦ ✦ ✦

No. 2,292,162, ANTISKID CHAIN LINK, patented August 4, 1942 by George Small Schmidt, York, Pa., assignor to American Chain & Cable Company, Inc., New York, N. Y., a corporation of New York.

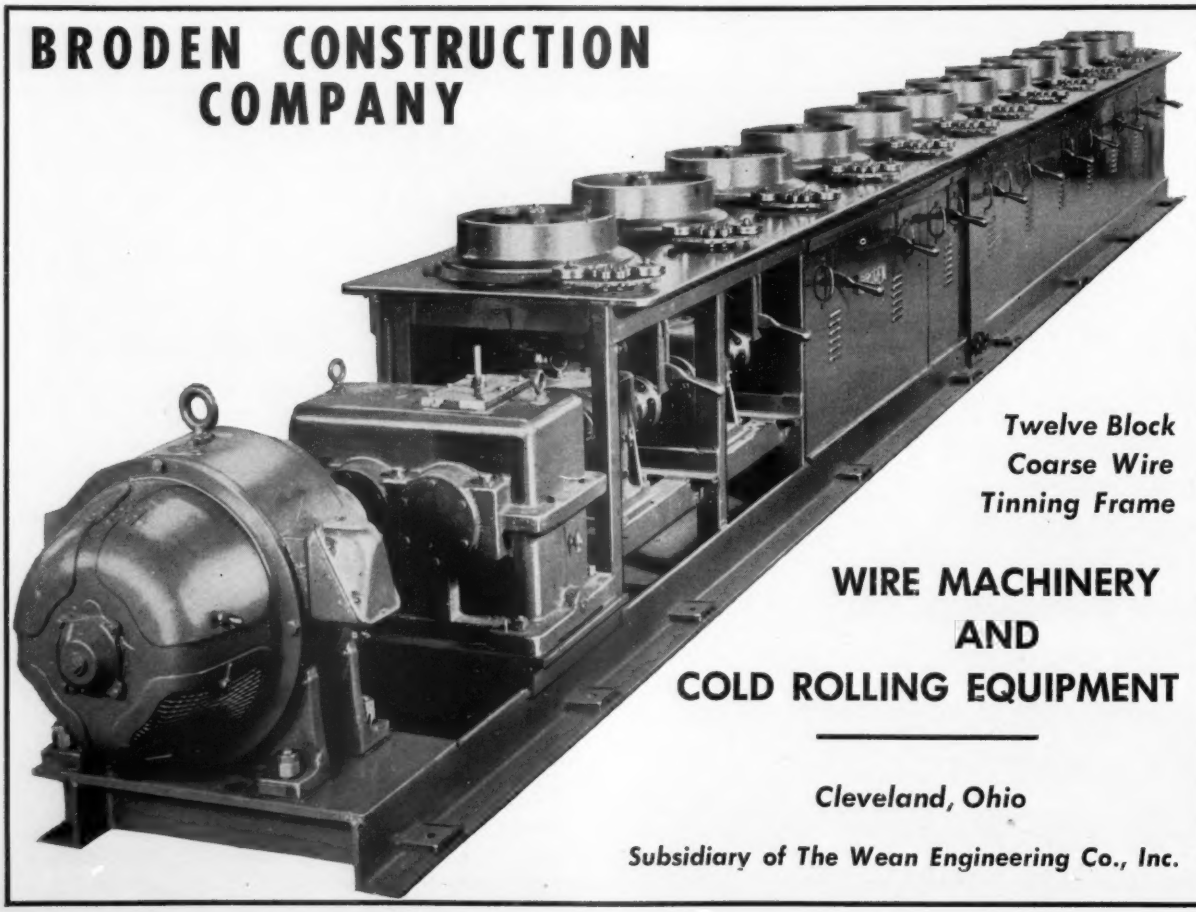
This link consists of a pair of generally V-shaped members having their apices facing in opposite directions away from each other, and each member having its legs crossing and projecting beyond the legs of the other member and welded thereto centrally of the length of the link to constitute the side strands of the link, the projecting portions of the legs constituting the anti-skid devices and the apices constituting the end loop-connecting portions of the link.

✦ ✦ ✦

No. 2,292,411, WOVEN WIRE BELT FOR FOURDRINIER MACHINES, patented August 11, 1942 by Walter C. Sutton, Shaker Heights, Ohio, assignor to The Lindsay Wire Weaving Company, Cleveland, Ohio, a corporation of Ohio.

Woven of round wires. the web is planular on both sides, and flattened on one side more than the other by distortion of the wires.

BRODEN CONSTRUCTION COMPANY



Twelve Block Coarse Wire Tinning Frame

WIRE MACHINERY AND COLD ROLLING EQUIPMENT

Cleveland, Ohio

Subsidiary of The Wean Engineering Co., Inc.

No. 2,292,557, WOOD SCREW, patented August 11, 1942 by Wesley Wilson, Chicago, Ill.

The screw has two spaced-apart threaded portions with a weakened portion above the uppermost threaded portion, but spaced some distance below the head.

✦ ✦ ✦

No. 2,292,663, WIRE BELT STRUCTURE, patented August 11, 1942 by Otto Carl Scherfel, Philadelphia, Pa., assignor to Audubon Wire Cloth Corporation, a corporation of New Jersey.

This construction includes a succession of helical coils of the same twist and flattened to provide hinge loops on the edges and straight intermediate portions connecting the loops, the coils being arranged with the turns in overlapping relation within the turns of adjacent coils and with the loops on one edge overlapping the loops on the edge of a non-successive coil to form a connecting rod opening with a connecting rod extending through each connecting rod opening to connect non-successive coils together.

✦ ✦ ✦

No. 2,2,792, UPHOLSTERY CONSTRUCTION, patented August 11, 1942 by Rutledge A. Parker, Max Kiessling, and Max J. Kiessling, Waterbury, Conn., assignors to Parker Products Corp., Waterbury, Conn., a corporation of Connecticut.

Coil springs are supported upon crossed metal strips, secured thereto by clips of new construction.

✦ ✦ ✦

No. 2,293,379, WIRE COATING APPARATUS, patented August 18, 1942 by Carl Bruining, Muskegon, Mich., assignor to Anaconda Wire & Cable Company, New York, N. Y., a corporation of Delaware.

Apparatus for coating wires is provided including a cage of parallel rods and a die within the cage and movable therein lengthwise of the rods, the die having a die passage therethrough.

✦ ✦ ✦

No. 2,293,506, MACHINE FOR MAKING TERMINALS, patented August 18, 1942 by Adolph W. Hoernle, Bronx, N. Y.

The machine is adapted to form terminals on the ends of lengths of wire.

✦ ✦ ✦

No. 2,293,563, CUSHION CONSTRUCTION, patented August 18, 1942 by Edward A. Ruggles, Detroit, Mich., assignor to The Murray Corporation of America, Detroit, Mich., a corporation of Delaware.

Zig-zag springs are disposed with their axes paralleling the axes of the coil springs, the latter springs being in pockets and the ziz-zag springs being aligned with rows of the pockets and secured thereto.

✦ ✦ ✦

No. 2,293,566, SPRING CONSTRUCTION, patented August 18, 1942 by Frank M. Shanahan, Detroit, Mich., assignor to The Murray Corporation of America, Detroit, Mich., a corporation of Delaware.

In this construction, sinuous spring strips form a unit assembly and have a set on an arc of small radius.

✦ ✦ ✦

No. 2,293,659, INSULATED WIRE, patented August 18, 1942 by John W. Murray, Kingston, N. Y., assignor to Hercules Powder Company, Wilmington, Del., a corporation of Delaware.

A lead wire, for an electric firing device, is insulated with cotton servings, some wrapped about the wire in a Z direction and some in an S direction in such a way that raveling is prevented.

✦ ✦ ✦

No. 2,293,930, SCREW, patented August 25, 1942 by Felix W. Braendel, Union City, N. J., assignor to Groov-Pin Corporation, Union City, N. J., a corporation of New Jersey.

This is of the self-cutting and self-locking type, and comprises a threaded pilot, the latter being longitudinally grooved to present thread cutting edges, the profile angle of the cutting thread portion being substantially more acute than that of the shank, whereby the latter will, as it is screwed home, cause locking deformation of the thread cut by the former.

If You Are Not A Member Of
The Wire Association —
Now Is A Good Time To Join!

For detailed information address

RICHARD E. BROWN, Secretary

THE WIRE ASSOCIATION
300 Main St., Stamford, Conn.

It's GOOD!
It's NEW!

It's GOOD NEWS to WIRE MEN!!!

Here's Why:

APEX "PIC-KLEEN" *eliminates* lime in many cases; a valuable *addition* to lime in *all* cases.

APEX "PIC-KLEEN" *entirely* eliminates time-consuming *sull-coat* operation.

APEX "PIC-KLEEN" is the finest *rust-inhibitor* for pickled wire under adverse storage conditions.

APEX "PIC-KLEEN" conserves dies and lubricants.

FOR USE ON ROUNDS *AND* SHAPES; ON HIGH OR LOW CARBON WIRE.

Negligible cost makes your inquiry imperative.

Address inquiries to:

APEX ALKALI PRODUCTS CO.

MAIN & RECTOR STS., PHILADELPHIA, PA.

Government Wire Production Information

(*Continued from Page 597*)

PD 149 must be filed by all producers of steel scrap who produce 50 gross tons or more of iron or carbon steel scrap, and/or 10 tons or more of alloy steel scrap, and/or one ton or more of high speed steel scrap during the month.

✦ ✦ ✦

PD 150 must be filed by all consumers of iron and steel scrap regardless of the tonnage consumed each month.

✦ ✦ ✦

PD 151 must be filed by all brokers and dealers who are buying and selling iron and steel scrap.

✦ ✦ ✦

THESE forms must be filed with the Bureau of Mines, Pittsburgh, Pa., not later than the tenth of the following month.

✦ ✦ ✦

IF you are not receiving your PD form, write the Bureau of Mines immediately. Those who fail to report as required are in direct violation to General Preference Order M-24 issued by the War Production Board and subject to prosecution.

✦ ✦ ✦

COMPLIANCE with the above is of utmost importance in helping to win this war!

✦ ✦ ✦

Critical Materials Limited to Telephone Companies

A RECENT War Production Board order restricted the use of critical materials for telephone companies involving a general revision of Conservation Order L-50 and affects the wire industry in the following manner.

1. **It prohibits the placing of open copper wire in local exchange line plants.**
2. **It restricts the use of copper or steel wire for plant extensions.**
3. **It limits material for operating construction for an exchange plant to $2500.**

✦ ✦ ✦

Iron, Steel Products Resellers Under Licensing Control

WAREHOUSES and other resellers of iron and steel mill products and of some finished iron and steel products were brought under uniform licensing control by the OPA, September 12.

✦ ✦ ✦

SUPPLEMENTARY Order No. 17, effective September 17, automatically licenses all sellers of iron and steel products for which ceiling prices are established by any of the following maximum price regulations:

No. 46—Relaying Rail.
No. 49—Resale of Iron and Steel Products.
No. 159—Fabricated Concrete Reinforcing Bars.

✦ ✦ ✦

UNDER these regulations falls the resale of ingots, semi-finished iron and steel products, finished hot rolled or cold rolled iron and steel products, and other iron and steel products further finished in a manner commonly performed at steel works or rolling mills; also, all sale of fabricated concrete reinforcing bars and relaying rail.

✦ ✦ ✦

THE order makes an OPA license a required condition for selling any iron or steel product covered by these regulations, and

All-Metal WIRE SPOOLS

CABLE SPOOLS . . . *for Insulated and Rubber Covered Wire, Solder, and similar products.*

These spool ends are formed from cold rolled steel of gauges to meet specific demands for strength. The edges are curled and ribs embossed for increased rigidity. Panels may be worked into your design and embossed, for use in marking size and variety. All parts are lithographed for identification purposes and to protect the metal.

Ends and traverses may be shipped unassembled. A simple operation on a hand, foot, or power press makes rigid and permanent assembly.

Made in 5", 6½" and 10½" diameter Ends; Traverses 1 15/16" diameter (or special 3½" diameter for 10½" End), in any desired lengths.

FINE WIRE SPOOLS . . . *for winding and shipping Fine, Steel, Copper, and Enameled Wires.*

Spools are formed from black plate tested for maximum rigidity. Made with locked-seam barrel and one-piece ends, they are so assembled that there is no possibility of wire being trapped in the joint where barrel and end meet. Ends are made with full curl on edge, which provides additional strength and a smooth winding edge.

Entire spool may be finished with gold lacquer or a variety of colored lacquers; with or without identifying copy embossed in the ends.

Made in 2 7/16" and 3" diameter Ends. The 2 7/16" size is made with 1½" diameter Traverse only; the 3" diameter with 1½" or 1¾" diameter Traverse.

We will send samples at your request.

J. L. CLARK MANUFACTURING CO.
600 23rd AVENUE • ROCKFORD, ILLINOIS

permits a court to suspend the license for violation of a price regulation.

✦ ✦ ✦

RETAILERS are excluded from the new licensing order, since they are already licensed under the general maximum price regulation.

✦ ✦ ✦

THE order also contains a provision permitting the Price Administrator to require licenses to register with the OPA.

✦ ✦ ✦

Paper Mill Wire Weavers Told How to File PD-25A

PULP and paper mill wire weavers were given additional instructions August 8 on how to file PD-25A applications for materials for paper machine wires under the production requirements plan.

✦ ✦ ✦

THE instructions, issued by the pulp and paper machinery section, are based on the wire cloth plan developed by the section over a period of several months.

✦ ✦ ✦

IT was pointed out that applicants in the United States and Canada are not required to break down wire containing copper into different sizes. All the wire can be grouped into one figure. However, in addition to total quantity of wire, the amount of copper contained in the wire must be shown with maximum approximations of tin and zinc.

✦ ✦ ✦

Wire Coat Hangers

BECAUSE the manufacture of wire coat hangers has been stopped to conserve steel, Price Administrator Leon Henderson has announced that dry cleaners and laundries may require a reasonable deposit—of from one to five cents—to insure the return of such hangers used in delivering finished garments.

✦ ✦ ✦

THIS statement was made in an interpretation of Maximum Price Regulation No. 165, as amended (Services), which places a ceiling on dry cleaning, laundering and similar services in which coat, suit and dress hangers are commonly used.

✦ ✦ ✦

War Production Posters

THE needs of total war require total production. In order to stimulate production, the Office of War Information regularly issues posters on subjects relating to the war.

THESE posters are available free of charge and may be obtained by writing to the Bureau of Public Inquiry, U. S. Information Center, Washington, D. C. A permanent mailing list is maintained to receive copies of posters regularly.

✦ ✦ ✦

TO BE placed on this mailing list, write to the distribution section, Office of War Information, Room 5542, Social Security Building, Washington, D. C.

(*Please turn to Page 616*)

HERE'S THE "Triple-Threat" DIE for

1 LONGER RUNS...

2 GREATER ACCURACY...

3 SMOOTHER FINISH...

INCREASED tonnage . . . highest accuracy . . . unblemished finish . . . those are your principal needs today! TECO Carbide Dies give you all three because their rigidly controlled uniformity, density and hardness produce longer runs of smooth, on-size wire.

Equip your wire machines with long-wearing TECO Carbide Dies and watch your tonnage mount. A test run in your plant will PROVE these facts. Our engineers will gladly discuss your requirements.

Wire and Bar Dies, Extruding Dies, Tubing Dies, Sizing Dies. Also, Carbide Blanks, Tools, Bits, Reamers, Broaches, Forming Tools.

TUNGSTEN ELECTRIC CORPORATION
564 39th STREET • UNION CITY, NEW JERSEY
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representative: Architects and Builders Bldg., Indianapolis, Ind.

TECO — Pioneers in Tungsten Carbides for over a Quarter Century — CARBIDE DIES

Government Wire Production Information

(*Continued from Page 615*)

Wholesalers of Wire, Cable Accessories Covered by P-82

BROADENING of the scope of Revised Price Schedule No. 82 to cover wholesalers as well as manufacturers of wire, cable and cable accessories, was announced recently by Office of Price Administration.

✦ ✦ ✦

"WIRE, cable and cable accessories are frequently marketed through wholesalers," the Price Administrator explained. "Maximum Price Regulation No. 136, as amended — covering machines and parts and machinery services — became effective July 22, 1942. In the absence of Amendment No. 2 to Revised Price Schedule No. 82, the terms of the machinery regulation would cover wire, cable and cable accessory wholesalers.

"COMPELLING reasons dictate that wire and cable wholesalers be subject to Revised Price Schedule No. 82, rather than Maximum Price Regulation No. 136, as amended," he added. The base date for manufacturers under Schedule No. 82 is Oct. 15, 1941, while the base date in Regulation No. 136 for most manufacturers and wholesalers is Oct. 1, 1941.

✦ ✦ ✦

"THUS, if this amendment were not issued, manufacturers of wire and cable would be permitted to base their prices on Oct. 15, but their wholesalers would be forced to base their prices on Oct. 1.

✦ ✦ ✦

"AS many manufacturers had increased their prices in the interval between Oct. 1 and Oct. 15, and as Schedule No. 82 permits an adjustment of Oct. 15 prices for increases in the price of lead and for solid copper weatherproof wire, the retention of an Oct. 1, 1941 base date for wholesalers would work an obvious injustice."

FOLLOWING exemptions have been established by the amendment:

1. **Sales and deliveries of wire, cable and cable accessories under "developmental" contracts in connection with the war program.**
2. **Sales and deliveries under "secret" war contracts.**
8. **Purchases made by the United States government under emergency conditions also are exempted, although a report of the emergency sale or delivery must be filed with OPA if the transaction involves $500 or more. The report must state the circumstances necessitating the purchase at a price exceeding established maximums.**

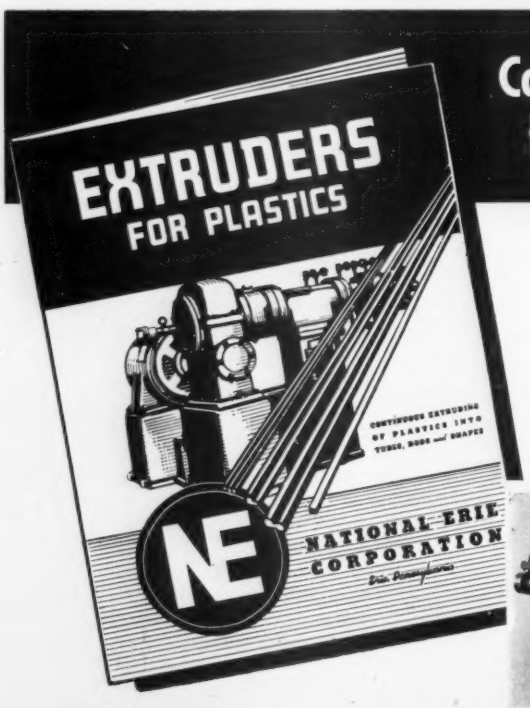
✦ ✦ ✦

THE foregoing exemptions are to apply not only to the United States, but also to governments receiving lend-lease assistance.

✦ ✦ ✦

Transfers of Copper From Idle Stocks Prevent War Plants From Closing Down

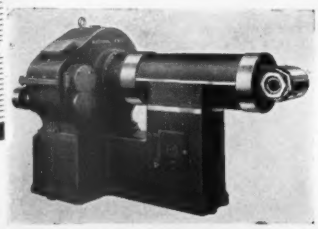
TRANSFERS of copper from idle and excess inventories to producers needing this critical metal for the manufacture of



Continuous Extruding of Plastics for Wire Insulation and Trim

SEND for a copy of this bulletin that will tell you about a new line of Extruders that has been developed from our well known rubber extruding work. Every machine we build today must contribute directly to the winning of the war—however, you will want to have this bulletin on file whether your need is urgent or not. Write for a copy.

National Erie builds a complete line of Extruders, Presses, Mixing Mills, Special Doors for Pressure Vessels, etc., for rubber and plastics.



NATIONAL-ERIE CORPORATION
ERIE, PA. U. S. A.

munitions, planes, tanks, and other implements of war are aiding hundreds of war plants to maintain schedules and, in many instances, are preventing complete shutdowns when emergency shortages occur.

✦ ✦ ✦

Stock Piles Maintained

THIS was revealed September 9 when the inventory and requisitioning branch of WPB announced that 29,700,000 pounds of copper and copper base alloys have been allocated from immobilized stocks to war production channels through the WPB's copper recovery program, instituted 8 weeks ago.

✦ ✦ ✦

OF this total 2,400,000 pounds were allocated for stockpiling to meet future anticipated demands for standard shapes and sizes of mill products; 6,300,000 pounds were reported and allocated as scrap; 9,300,000 pounds were allocated, or known to have been moved for use in existing form under Priorities Regulation No. 13, and 11,700,000 pounds were allocated to brass mills and ingot makers for remelting.

✦ ✦ ✦

IN making the announcement, E. A. Tupper, chief of the inventory and requisitioning branch, said:

To date over 14,000 firms have reported a total of 111,000,000 pounds of idle and excess inventories of copper and copper base alloys. Much of the copper reported has been offered for voluntary sale at the Government's prices. That which the owner refuses to sell but which is nevertheless needed for war production will be requisitioned.

Copper and copper base alloys are now being allocated from idle inventories into strategic war production at the rate of over 4,000,000 pounds a week.

While this is double the original estimate for this date, the current needs of our vast war production machine are now so great that even this figure must again be doubled within the course of the next few weeks.

✦ ✦ ✦

Editorial Correction

IN the August Issue of WIRE & WIRE PRODUCTS an article was published entitled **"A Discussion of Coated Electrodes and Their Properties"** in which one of our editors added a first paragraph not written by the author.

✦ ✦ ✦

THIS addition read as follows:

"A little more than a decade ago, the use of coated welding electrodes began to spread rapidly. Since, in order to make an arc weld successfully, a substantially constant arc length had to be maintained, it was found a thin coating to automatic welding wire tended to stabilize the arc and control the melting rate."

✦ ✦ ✦

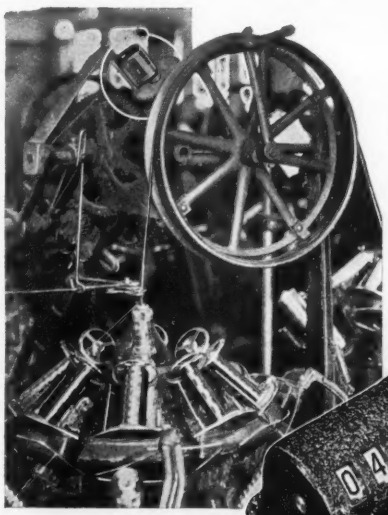
IT has been called to our attention that the points mentioned in this paragraph were not germane to the subject covered by the author and did not relate directly to the material presented.

For Information
Regarding
The Wire Association
Address
Richard E. Brown, Secretary
300 Main Street, Stamford, Conn.

NEEDLESS to say, the Editor's face is quite "red" and we offer this correction and apology to those who read the article and who might have received the impression feared by the author as a result of our editorial "Correction."

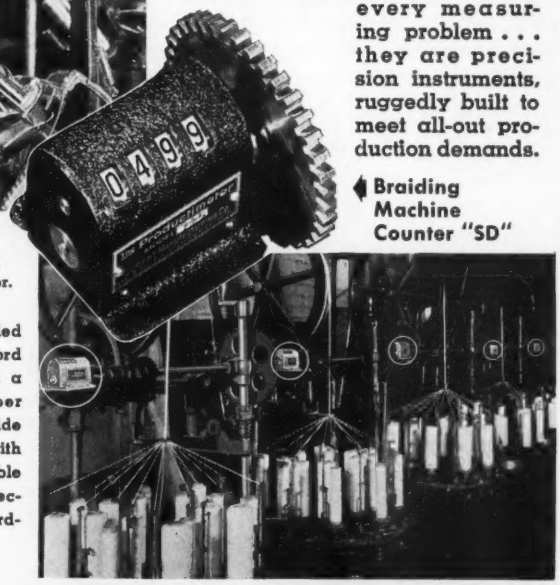
YOUR
Victory Production
demands
PRODUCTIMETERS

In doubling and tripling production for Victory, it is essential that exact records of measurement be kept on production machines in the Wire Industry *without* loss of time. Productimeters can be relied upon for every measuring problem . . . they are precision instruments, ruggedly built to meet all-out production demands.



Model 4-SD-3
Productimeter attached to Wardwell 16-Carrier Braider.

Braiding Machine Counter "SD"



Model SD Counters installed on Braiding Machines record production and establish a fixed cost of braiding per foot. Furnished with outside gearing as illustrated, or with internal gearing and flexible coupling for direct connection to capstan, and recording directly in feet.

Model 4-SD-3 on New England Butt Braiders

Durant offers a very complete line of Wire Measuring Units with models for bare cable, insulated wire, rough-surfaced conductors, armored cable, chain, and for oily, greasy materials. Capacities from 0" to 3½" diameter . . . Speeds from 600 to 5000 counts per minute. Write our Engineering Department about your measuring problems, today!

Wire Measuring Catalog No. 3 sent on request.

DURANT MANUFACTURING COMPANY
1918 N. Buffum St., Milwaukee, Wis. 176 Eddy St., Providence, R. I.
PRODUCTIMETERS
THE SPEEDOMETERS OF INDUSTRY

Fig. 1. Photograph of bulletin board in the open hearth department of Donora Steel Works of American Steel & Wire Co., U. S. Steel subsidiary. As production rises, the ingot and the arrow rise accordingly allowing the plane and tank to descend.

✦ ✦ ✦ ✦ ✦

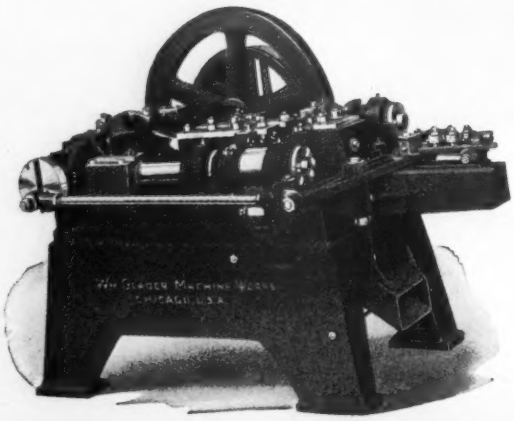
War Production Bulletin Board

A NOVEL war production bulletin board showing graphically how increased production can help defeat the axis powers has been installed in the open hearth department of American Steel & Wire Company's Steel Works at Donora, Pa. The board is the result of combined efforts of the Industrial Relations department and the Sales Promotion and Advertising Department working together with the labor-management committee in the plant.

✦ ✦ ✦

ARRANGED to show weekly production in the open hearth

HIGH SPEED WIRE NAIL MACHINE



WM. GLADER MACHINE WORKS

210 N. Racine Ave. Chicago, Illinois

Glader Machines on large head, single-blow roofing nails can be seen in operation at any of the independent wire mills in the United States.

The production figures on common nails shown below, are guaranteed.

SIZE MACH.	SIZE WIRE	MAX. LENGTH OF WIRE	NUMBER OF NAILS PER MIN.	CAP. IN POUNDS PER HR.
#00A	#16	1⅛"	700	37.2
#00	#14	1¼"	550	55
#0	#12	1¾"	450	89
#1	#10	2½"	400	192
#2	#8	3½"	325	310
#3	#4	5"	225	523
#4	#1	7"	190	622
#4s	5/16"	9"	175	1155
#5	⅜"	12"	160	2400

This high output and economical operation account for the GLADER machine being accepted as standard equipment in all recent installations.

department, the board has a replica of an ingot being grasped by a pair of tongs which is counter-balanced by the figures of an airplane and a tank. As production progresses during the week, the ingot rises causing an arrow to point to the percentage of production for the period, at the same time allowing the plane and tank to descend. When the arrow reaches 70%, the plane and tank are level with the bottom of the board and are then disconnected and placed in front of a horizontal chart showing production figures ranging from 70 to 105 per cent. The figure of a soldier then pushes the plane and tank toward caricatures of Hirohito, Hitler and Mussolini who retreat before the oncoming armament. When production reaches 105%, the axis powers are forced to disappear into a simulated cloud of smoke with a loud "boom".

✦ ✦ ✦

Copper Curtailed in Fuses

IN order to save 1,200 tons of copper annually, the War Production Board has prohibited the use of the metal or its alloys to manufacture parts for fuses, other than current carrying parts.

✦ ✦ ✦

THE order, Limitation Order L-161, also prohibits the assembly of fuses with copper parts other than parts carrying electric current.

✦ ✦ ✦

"Order Blank" Simplifies Copper Buying

AN "order blank," known formally as Form PD-595, makes it easy for users of copper and copper base alloy products who hold the necessary preference ratings to purchase these products from owners of frozen, excess, or idle inventories. The blank was released August 26 by the WPB copper branch.

✦ ✦ ✦

THE copper recovery section of the copper branch, located at 200 Madison Avenue, New York City, has detailed inventories of millions of pounds of copper products, in the form of sheet, rod, tubing, wire, and shapes which can be sold to war plants. No metal can be sold except on a rating of A-1-i or higher.

✦ ✦ ✦

Submerged Combustion Takes Its Place in the War Industries

(*Continued from Page 550*)

other part of the equipment. In fact, one user reports that the maintenance on his Submerged Combustion units run below the average for the other machinery in his plant.

✦ ✦ ✦

THAT these burners very quickly take their place among the the dependable production machinery in a plant is pretty clearly shown by the reply given to a service man who called to check up on a unit which had been in operation over two years. When asked how the unit had been doing, the Superintendent replied, "Why, hells fire, if it weren't for our production figures, we wouldn't even know it was there."

WILLEY'S SIZING, EXTRUSION AND WIRE DRAWING DIES

Sales Engineers in Principal Cities.

They are made from a specially developed grade of Tungsten Carbide having those characteristics needed for dies—freedom from porosity, great abrasion resistance and the ability to take a polish equal to that of diamonds.

FOUR CLASSIFICATIONS OF WILLEY'S DIES

A. Blank and rough cored nibs.
B. Rough cored dies (cased).
C. Semi-finished, rough drilled dies (cased).
D. Finished dies, ready for use.

WRITE FOR NEW CATALOG

Gives full information on Willey's Dies in addition to other standard tools.

Standard Sizes from .325 to 4.000. Special Sizes and Shapes Made to Order.

WILLEY'S CARBIDE TOOL CO.
1340 W. Vernor Highway, Detroit, Michigan

How to Organize and Carry Out A Factory Scrap Campaign

A SALVAGE program in a plant, factory, shop or yard, must be based on the fact that industrial salvage and conservation form the backbone of the War Production Board's campaign to put the nation's waste back into production. Unless American industries take on the major job of making broken down, dismantled or unusable materials available for scrap, the national supply of steel for manufacture of war equipment will be endangered. For, if steel mills are not assured of an adequate supply of scrap, they cannot continue to keep up production of the steel which goes into planes, tanks, guns and ships we need to win the war.

✦ ✦ ✦

SUCH factors as type of work and the size of plant, partially govern the organization of a company's salvage operations. But common methods of organization of a scrap campaign, collection, segregation and disposal, are available to all.

FIRST, the organization to operate an effective salvage collection need not be elaborate or costly. It works best when it is simple and unencumbered with extra officials and unnecessary steps. An able executive of the company should head it up as Salvage Manager. He should work with superintendents and foremen in various departments. He must be armed with ample authority to make decisions to scrap unused material.

✦ ✦ ✦

TO start the ball rolling, these men should make a survey of their departments and report to the Salvage Manager machines and equipment which are obsolete or out of active production. The Salvage Manager should make a written report of these findings, as a basis for action.

✦ ✦ ✦

IT is management's function to mark and send to the scrap heap equipment that is obsolete. After inspection, use this yardstick in coming to a decision: If a machine or other piece of equipment hasn't been used for three months, and if it can't be proved that it will be used in the next three, turn it over where it can be used . . . or scrap it. Either dispose of equipment in industry if there is a call for it, or put it to work as scrap for the weapons of war.

✦ ✦ ✦

ONCE such equipment has been marked for scrap, a responsible shop man should supervise its dismantling and classification. The assortment may be made to yield valuable replacement parts for machines in operation. Cutting down the need for purchasing new parts will remove the plant from the competition for equipment.

✦ ✦ ✦

NO salvage campaign can be successful without the wholehearted cooperation of every person in the plant. Remember that even the most worthwhile cause needs the proper promotion to put it across. The battle for scrap to keep our production going is dramatic enough to put over with a bang. Stunts, posters, billboards and frequent mention in company publications or house organs are excellent vehicles for capturing

THE AMERICAN BOYS WILL WIN THIS WAR IN 1943

OR

SOONER IF WE GIVE THEM OUR 100%

SUPPORT IN EVERYTHING

There's No Way Like The American Way

Why?

BECAUSE:

I can go to any church I please—
I read, see and hear what I choose—
I can express my opinions openly—
My mail reaches me as it was sent . . . uncensored—
My telephone is untapped—
I can join any political party I wish—
I can vote for what and whom I please—
I have a constitutional right to trial by jury—
I am protected against unlawful search and seizure—
Neither my life nor my property can be forfeited without due process of law—

MONEY . . . WORK . . . LOYALTY . . .

War Bonds are the very best life insurance you can buy . . . We all should be working now 12 hours a day . . . six days a week . . . keep up the "morale" at home and with the boys . . . give them everything required to carry on the fight . . . and give it now . . . not in 1943 . .

We can . . . We will . . . We must win . . .

WE HAVE AMPLE SUPPLY OF OUR "INHIBITORS" TO FILL ALL THE REQUIREMENTS OF THE STEEL INDUSTRY . . .

"NEP"

ACID INHIBITOR TO CONTROL PICKLING

"NEP" and SUMFOAM . . . FOR 28 YEARS

The Wm. M. Parkin Co.

HIGHLAND BUILDING

PITTSBURGH, PENNA.

Chemical Engineers to Steel Industry

and sustaining employes' interest in the program. In most plants, excellent talent can be recruited for this promotion from among the employes.

✦ ✦ ✦

WORKERS should be urged to contribute suggestions and ideas for increasing salvage output. These may either be cleared through the foreman or written on slips and deposited in a suggestion box. Occasional rewards and incentives for outstanding cooperation in the salvage campaign will bring out employes' initiative. Workers can make or break a program. If their enthusiasm is enlisted and maintained, they will prove collaborators who will match the efforts of management.

✦ ✦ ✦

BINS and containers—preferably displaying a poster or a slogan — should be placed in strategic spots throughout yards and plants. These serve as depositing places for production scrap, salvaged waste materials and contributions which workers bring from their home. Separate containers for different metals, rubber, twine, etc., will save time sorting the material.

✦ ✦ ✦

SCRAP is of use to the war effort in direct proportion to the speed with which it is gotten back into production. Arrange regular daily or bi-weekly schedules for the various departments and sources of supply. The Salvage Manager should see to it that collections are turned in on time to a central collection depot in the plant. Select a definite date each week for shipment to a junk dealer or have the salvage shipped by the company to the nearest collection point.

✦ ✦ ✦

REMEMBER that scrap bears no label. It is old jigs, dies, castings; or it is a ten-ton machine that can't be used. Waste metal, rubber, burlap and other critical materials are valuable even in small amounts. Every pound of these materials can be salvaged by industry for war work.

(*Please turn to Page 622*)

F. A. HARRIS, INCORPORATED

425 Liberty St., Springfield, Mass.

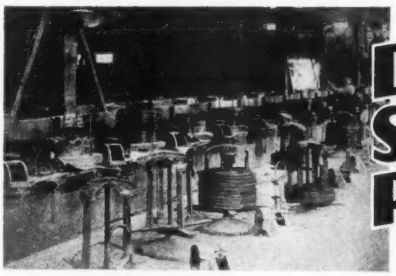
MANUFACTURERS

of

FINE WIRE

Brass	Aluminum	Phosphor Bronze
Steel	Nickel Silver	Brush Wire
Monel	Stainless Steel	Music Wire
Spring Wire	Mandrel Wire	Weaving Wire
	Resistance Wire	

Flat and Special Shapes



Do You Want Still Greater Production Speed?

It is possible that you can speed up your wire drawing operations materially, without affecting the quality or finish of your wire or the life of your dies.

MAGNUS
Wire Drawing Compounds

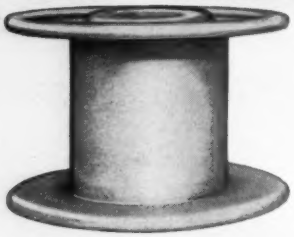
are especially designed for wire drawing operations—many of them having resulted from the solution of special problems which are similar to your own operations. They cover dry and wet drawing of all types of wire as well as grease drawing operations. Tell us what kind of wire drawing you do and let us make specific recommendations with the purpose of giving you faster production. If you have any particularly difficult problems not answered by our regular line of compounds, we will be glad to work out special materials in our laboratory.

Write for Your Copy of "Magnus Drawing Lubricants for Ferrous and Non-Ferrous Wire."

MAGNUS CHEMICAL COMPANY
Manufacturers of Cleaning Materials, Industrial Soaps and Metal Working Lubricants.
188 South Avenue — Garwood, N. J.

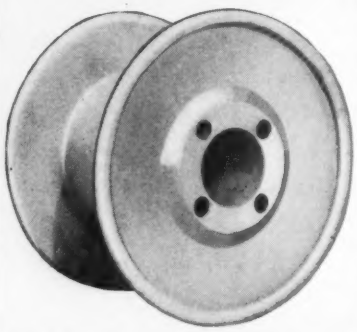
MAGNUS CLEANERS

FOR HIGHEST SPEEDS



APCO MOSSBERG
PRECISION
STEEL REELS

The reels that are engineered to the job... designed and built by the company that originated the steel reel idea . . . are the reels you should be using in your plant. Every year, more and more Apco Mossberg Steel Reels are bought by quality-minded buyers throughout the wire industry.

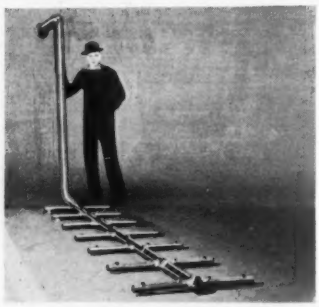


REELS..SPOOLS..BOBBINS

FREE
ENGINEERING SERVICE

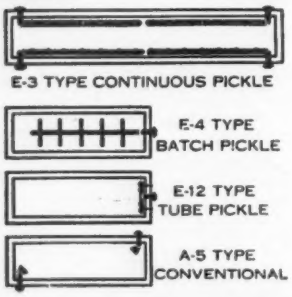
Without obligation to you, Apco Mossberg engineers will be glad to study your reel problem, and supply complete suggestions, drawings, blue prints. Write for information today.

APCO MOSSBERG COMPANY
(THE ORIGINAL FRANK MOSSBERG CO.)
21 LAMB ST., . . . ATTLEBORO, MASS.



FASTER . . PICKLING
WITH HEIL
STEAM-AIR AGITATOR
JETS

SAVES ACID
•
UNIFORM HEATING
•
MORE CHEMICAL ACTION
•
CUTS REJECTS



COMBINE HEATING AND AGITATING ACID BATHS
•
20% TO 40% MORE PRODUCTION
PROVEN IN MILL PRACTICE

The complete HEIL line includes pickling, anodizing and plating tanks, lead and carbon heating coils, syphons. Write us for details.

HEIL ENGINEERING CO.
(Formerly Heil & Company)
12901 ELMWOOD AVE. CLEVELAND, OHIO
SEE EXHIBIT AT METAL SHOW, BOOTH A-332

How to Organize and Carry Out A Factory Scrap Campaign

(*Continued from Page 621*)

TREAT the factory to a house cleaning. What was junk six months ago has its place in the war effort now. Sort rubbish carefully. Salvage what can be used, and burn or otherwise dispose of the real rubbish that cannot. Keep the premises clear of debris. This is the only method by which it can be made certain that there is nothing further to be salvaged.

✦ ✦ ✦

EVERY bit as important as salvaging vital materials is the need to conserve what we have. Use less by making better use of what we have. Get this message across to the workers. It will benefit our sons and relatives in the armed forces. By preventing spoilage and breakage, the material we work with can be turned against the enemy.

✦ ✦ ✦

IN order to coordinate the salvage campaign in the individual plant with the national effort, it is essential that regular reports on the amounts collected, according to classification, be delivered to the Industrial Salvage Committee set up by the War Production Board in your community.

✦ ✦ ✦

ABOVE all, make clear to all personnel that until the day when we have actually turned out all the war equipment we need to smash the Axis, salvage and conservation are going to remain vital phases of our production. Unless our scrap is turned into weapons **now**, America will be fighting the war with one hand tied behind its back.

✦ ✦ ✦

Carboloy Announces Standard Line of Boring Tools

TO further expedite delivery and reduce costs of carbide boring tools, Carboloy Company, Inc., has standardized such tools in both solid Carboloy and Carboloy tipped styles and is placing the complete standard line in mass production similar to the standard line of Carboloy facing and turning tools.

THE standard boring tools are being made available in sizes ranging from 3/32 to ¼ in. diameters in the solid Carboloy form, and in diameters ranging from 5/16 to ½ inch for the tipped types.

✦ ✦ ✦

BOTH solid and tipped types will be furnished cylindrically ground to a tolerance of plus 0.000 to minus 0.001 inch with cutting edges unground. This will permit the user to grind cutting edges to suit specific jobs.

✦ ✦ ✦

IN this manner, it will be possible for users of boring tools to reduce inventory on Carboloy boring tools, since it will not be necessary to maintain separate tool reserves for each differently shaped boring tool required.

✦ ✦ ✦

THE line comprises 6 sizes of solid Carboloy boring bits and 4 sizes of tipped tools, with each of the latter available in the two styles described above. Tipped tools, with each of the latter available in the two styles described above. Tipped tools have a shank length of 2 inches for the 5/16 and ⅜ diameter sizes, while larger sizes have a shank length of 2½ inches.

✦ ✦ ✦

Standard Steels Analysis Chart

THE American Steel & Wire Company has produced a new chart giving chemical composition limits of AISI, SAE and NE (National Emergency) Standard Steels. Nearest aeronautical material specifications are included.

✦ ✦ ✦

THE chart is approximately 14″ x 22″ in size, usable as a wall hanger, also hinged so it can be folded to 11″ x 14″ and kept in a desk drawer for reference. Tabular matter is printed from large, clear type, in four colors, for quick identification.

✦ ✦ ✦

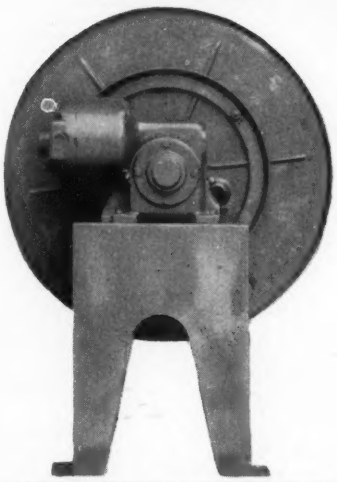
COPIES may be obtained without charge by writing on business letterhead to Advertising Department, American Steel & Wire Company, 408 Rockefeller Building, Cleveland, Ohio.

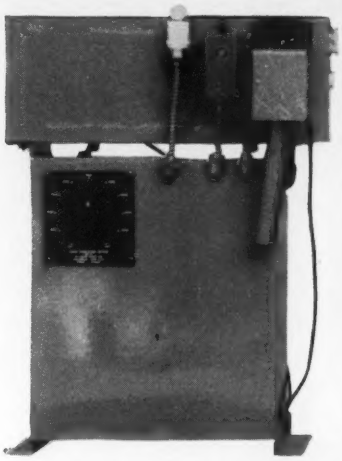
SPECIAL SPARKER FOR LATEX ASSAULT WIRE

(Signal Corps Specifications)

A COMBINATION SPARKER AND MOTOR TAKE-UP FOR AUTOMATIC TESTING AND VISUAL INSPECTION OF

LATEX WIRE





THE GEAR MOTOR ACTS AS A BRAKE AND STOPS THE MACHINE INSTANTLY WHEN FAULT OCCURS.

For Full Details Write to

R.L. Davis Electric Co.

WALLINGFORD, CONN.

OXYGEN FREE HIGH CONDUCTIVITY

OFHC

REG. U.S. PAT. OFF.

A Superior Copper FOR ALL PURPOSES

OFHC Copper conforms to the A.S.T.A. Specification for electrolytic copper wirebars, cakes, etc., B5-27 with regard to metal content and resistivity, and is free from cuprous oxide.

OFHC Copper is characterized by its freedom from casting defects and its bar-for-bar uniformity. Its freedom from oxygen results in great ductility and toughness as evidenced by its high reduction of area and resistance to impact.

OFHC Copper withstands more working in hard condition when tensile strength is greatest, making it especially suited for products subjected to severe fabricating or service conditions.

SALES OFFICE
THE AMERICAN METAL COMPANY, LTD.
61 Broadway, New York, N. Y.

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THE SCOMET ENGINEERING CO.
420 Lexington Ave., New York, N. Y.

CALLITE ...for WIRE

standout performance

CALLITE FINE WIRES are more in demand today than ever—for faster, uninterrupted output and higher performance efficiency. Absolute uniformity—accuracy of size, temper, tolerance and finish feature all Callite wires in sizes down to .002" (smaller on specification). If you are seeking outstanding wire quality—be sure to specify Callite.

Callite metallurgists will gladly recommend the most suitable composition and treatment for any given wire application. If you have an unusual problem, save time and costs—consult us **today.**

CALLITE TUNGSTEN CORPORATION,
572 39th St., Union City, N. J. Branches: Chicago, Cleveland.

CALLITE FINE WIRES

in sizes as small as .002" furnished in these metals and alloys...for springs, control cables, instruments, control devices, wire cloth, scratch brushes and other applications.

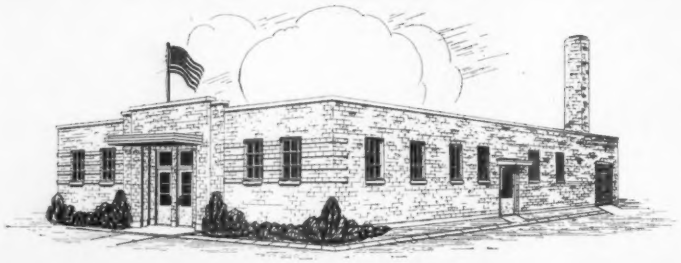
ALUMINUM
BERYLLIUM COPPER
BRASS—ALL GRADES
BRUSH WIRE
COMMERCIAL BRONZE
EVERDUR
NICKEL-SILVER
PHOSPHOR BRONZE
SILVER
SPECIAL ALLOYS
STAINLESS STEEL

CALLITE TUNGSTEN CT

Callite Wires

a fine wire for any need

ANNOUNCING A NEW HOME FOR FORT WAYNE WIRE DIES



Every Modern and Up-to-Date Facility for Manufacturing the Finest Precision

DIAMOND WIRE DRAWING DIES

All sizes from .0006 to .102

FORT WAYNE WIRE DIE, Inc.

2625 EAST PONTIAC ST., FORT WAYNE, IND.

Phone: Harrison 4319

"The War Production Program"

DIVISION of Information, War Production Board, Washington, D. C., has just issued a booklet entitled "The War Production Program." This is a description on the economics of war and provides a selection of reference material on America's war production program and the vast economic offensive in which this country is engaged.

✦ ✦ ✦

THE documentation includes citations on both the production and broader economic phases of the war including a special section devoted to the subject of economic warfare. Military operations, as such, do not come within the scope of the bibliography.

✦ ✦ ✦

WRITERS, students, public speakers, and research workers may find the compilation helpful in locating reliable sources of reference material on the background and development of the production program.

✦ ✦ ✦

COPIES may be obtained by addressing the Division of Information, War Production Board, Washington, D. C.

✦ ✦ ✦

New Folder on Heat Treating Issued by Surface Combustion

SURFACE Combustion of Toledo, Ohio, has issued two folders that should be of interest to concerns using heat treating equipment.

✦ ✦ ✦

ONE of these, SC-102 describes their standard rates industrial furnaces, illustrating and describing the characteristics and applications of each.

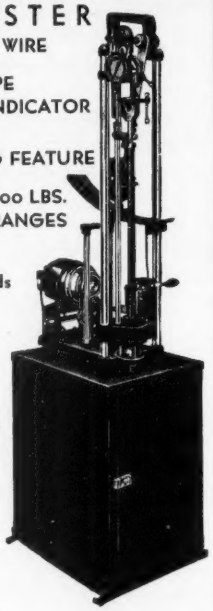
✦ ✦ ✦

THE second, SC-103, illustrates and describes furnaces that are particularly related to the big job of producing parts used in the production of ships, tanks and planes.

✦ ✦ ✦

SURFACE Combustion will be glad to mail one or both of these to anyone desiring copies.

AMTHOR
STANDARD TENSILE STRENGTH
TESTER
FOR LIGHT WIRE
DIAL TYPE
ELONGATION INDICATOR
WITH FIXED
READING FEATURE
MAX. CAPACITY 300 LBS.
IN THREE SUB-RANGES
Three Pulling Speeds
Quick Return
Latest
Improvements
Simple to Operate
Accurate Results
Write for Circular
Also on Higher
Capacity Tester



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New Book Compares Requirements of British, American Standards

Non-ferrous metals standards are summarized in new British publication. ✦ ✦ ✦ ✦ ✦

TABLES summarizing the requirements of both American and British specifications for non-ferrous metals have just been published by the British Standards Institution, specifically to help British companies to determine the extent to which they can work to American specifications. It was originally hoped, the BSI explains, that "Tables of Equivalency" could also be published that would indicate which American specifications provide material corresponding to that provided in relevant British Standards. The basis on which the specifications have been drawn up is not identical in the two countries, however, so that in many cases it has not been possible to prepare such tables of equivalents.

✦ ✦ ✦

THE 35 tables given in the new book summarize the composition limits and approximate ultimate tensile stress for each type of material and list the number of the British or American standard in which the requirements are found.

✦ ✦ ✦

THE summary was approved by the Non-Ferrous Metallurgy Industry Committee and endorsed by the chairman of the Engineering Divisional Council of Great Britain. It was published by the British Standards Institution under the authority of the General Council.

✦ ✦ ✦

COPIES of the book, British Standard 1007:1942, may be ordered through the American Standards Association Library.

✦ ✦ ✦

This is an invitation for you to become a member of The Wire Association. ✦ ✦ ✦ ✦ ✦ ✦

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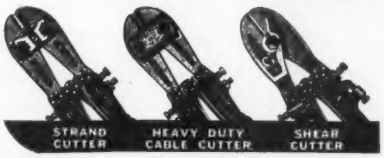

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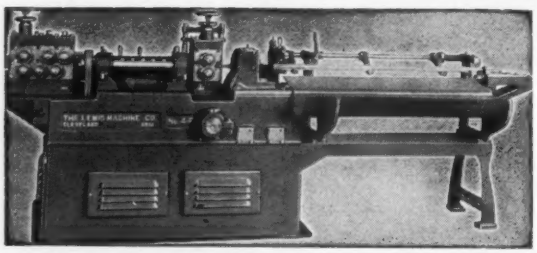
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Firth-Sterling Recommends New Milling Method

INCREASED production rates have resulted from a new method of surface milling recommended by the Firth-Sterling Steel Company. The process uses Firthite sintered carbide tipped inserted blades with both the rake and helix angles of the mills negative up to 10 degrees, with the cutters operating at speeds up to 10 times those normally used and with resulting feeds up to six times those of conventional high speed mills on hardened alloy steel parts.

✦ ✦ ✦

THE process, known as hyper-milling, shears the metal off in place of digging it off as in conventional practice. While the usual milling cutter might be compared to a carpenter's plane which digs into the work, the new method might be compared to a carpenter's scraper in which the angle of the tool is reversed. Hyper-milling

View of a hyper milling cutter in action on annealed alloy tooled steel at 419 R.P.M., with 1/16" depth of cut, and a feed of 5¾" per minute.

results in burnishing the surface of the work being milled, produces less tool wear and keeps both the work and the tool cooler, resulting in a minimum of distortion, even on fragile work pieces.

✦ ✦ ✦

USING Firthite T-16 at minimum speeds of 400 feet per minute with feed per tooth per revolution not in excess of .0015" and depth of cut not in excess of ⅛", production has been increased from

100 per cent to 300 per cent on a wide range of operations.

✦ ✦ ✦

HYPER-MILLING is particularly applicable to hardened, heat treated steels, including alloy steels which present difficult milling problems under conventional methods.

✦ ✦ ✦

Metals Salvaged From Ashes By General Electric

ASHES taken from two process-steam boiler pits in the salvage department's shop are yielding critical materials at one of the General Electric Company's major works.

✦ ✦ ✦

SHOP refuse and rubbish from all parts of the works are used for fuel. Ashes removed from the boiler pits are passed through a ball mill, or grinder; a magnetic separator, which separates the ferrous from the non - ferrous metals; and a concentration table which sorts out the finer particles. Metals reclaimed by this method include iron, steel, brass, copper and aluminum. In 1941 a total of 624,000 pounds was recovered, representing a gross cash return of $10,000.

✦ ✦ ✦

OTHER items, which in the past have been unsalvageable economically, are yielding critical materials in quantities that are worthwhile in these times. For example, the salvage department receives from the wire-drawing department a waste known as "copper and grease". It is taken from the pits under the wire-drawing machines and consists of a mixture of wire-drawing compound and fine copper particles. The wire-drawing compound is in liquid form, and contains water, soap and tallow which is applied to the drawing dies for lubrication and cooling. This flows into a pit underneath the wire-drawing machine and carries with it fine pieces of copper. It is shoveled from the pit into steel drums and when the water and grease are removed, the copper remains in dry, hard chunks. Last year 88,200 pounds of copper reclaimed in this way were shipped out to the smelters and vendors for conversion into raw materials. Gross return: $8,000.

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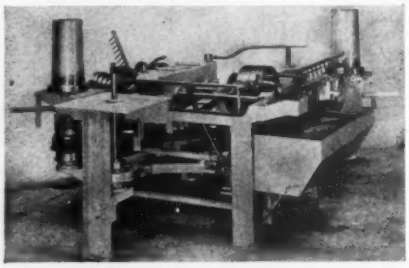

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Trouble Shooting on Bronze and Steel Weaving Wire

(*Continued from Page 536*)

THE defective wire was tested on this apparatus, and the same rhythmic variation in stiffness was found to exist.

✦ ✦ ✦

WIRE with such variation was rejected, and the wire which showed a uniform test on the quadrant gave cloth with a uniform texture.

A FURTHER study of wires of satisfactory quality resulted in standard specifications for each size and grade of wire in which the allowable variation in degrees was given. The weaving mill and wire mill each had testing jigs properly calibrated and troubles from this source ceased forthwith.

✦ ✦ ✦

Summary

IN general, then, the qualities desired for weaving are not unusual. Wire must be of the proper stiffness for the type of cloth manufactured, and this may run from spring wire to the softest annealed iron possible to produce; the stiffness or temper must be uniform, the wire must be on size and round, and it must not be brittle. What more can you ask of any wire? The old idea that a weaving mill like a nail mill was a handy place in which to use rejections has long since been exploded and weaving wire has assumed its place as a special quality product worthy of and demanding all the skill and care of the wire mill for its successful production.

✦ ✦ ✦

Army-Navy Production Award to National Wire Die Company

AS we go to press we are advised by Mr. Clifford A. Wolf of the National Wire Die Company, 30 Irving Place, New York, N. Y., that their firm has been awarded the Army-Navy "E" for production on fine wire drawing dies ranging from .0039 upward.

✦ ✦ ✦

THIS, we believe, is the first awarded to the fine wire die industry and Mr. Wolf and his fellow workers are to be congratulated.

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Expansion of the Moslo Machinery Co.

BACK in 1937, a young man with vast experience in the machinery field and with unbounded faith in his own ability to lick the problems of machinery sales and design, founded a business.

✦ ✦ ✦

TODAY, the name of Moslo Machinery Company is known the world over. Firms in the United States, Russia, England, Canada and Australia are turning out products with Moslo designed and built equipment. Even with the world at war, it is not unusual for this company to have inquiries on both standard and specially designed equipment from the far corners of the earth.

BEGINNING with a small Engineering and Sales office located on Euclid Avenue in Cleveland, Ohio, Moslo Machinery Company designed equipment and had it built in outside shops. The

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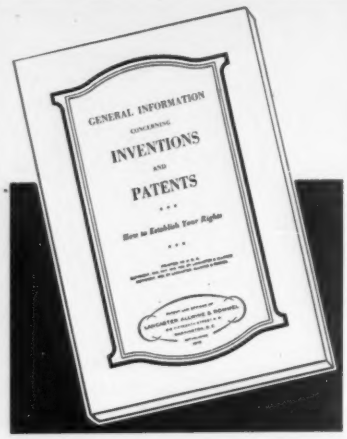

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company also represented, as sales agent, several of the better known machinery manufacturers. By showing unusual ability to understand and to solve his customers' problems, Moslo's business expanded to a point that he found it necessary to establish his own machine shop. During this period the "Shiftweight" wire reel was developed and marketed. Based on hydraulic laws of motion, this wire handling reel found wide acceptance in the trade. It proved to be a true "one-man reel" showing to its users tremendous savings of time and increased ease in the handling of wire coils. Following the "Shiftweight" reel, came an automatic welding rod feeder. This feeder was designed for the continuous feeding of cut and straightened rod to welding rod extrusion presses. Its adaptability and flexibility proved so great that industry rapidly adopted the feeder. A companion machine for end brushing of welding rod electrodes was also developed and found immediate acceptance. Demand for these units along with related equipment for the manufacture of welding rod electrodes, forced expansion of the Moslo Machinery Company and, in April of 1941, the concern purchased a building on Superior Avenue. Space was carefully laid out and a complete modern machine shop put into operation. The building and facilities at that time seemed ample for many years to come but defense work constantly placed greater demands on the welding electrode industry and manufacturers of these welding elec-

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ZINC WIRE
ZINC STRIP
THE PLATT BROS. & CO.
WATERBURY, CONN.

trodes began to turn more and more to Moslo Machinery Company with their problems for specialized production equipment. Production facilities again became strained and September of this year saw the company move once more; this time it purchased buildings three times as large as its former quarters. A completely staffed engineering department is now available for the design of special equipment and ample shop space is devoted to prompt production.

✦ ✦ ✦

IN February of 1942, a man widely known throughout industry, became associated with the Moslo Machinery Company. This man, **G. A. (Gus) Sohl**, had been with the Lincoln Electric Company for some fifteen years. In taking up his new duties with the Moslo Company, Mr. Sohl became General Sales Manager of the Machinery Resale Division and now directs a staff of trained salesmen, well qualified in the sales and service of machines and equipment.

✦ ✦ ✦

AT the present time, Moslo Machinery Company is producing a complete plant for the production of welding electrodes under orders of one of the United Nations Governments. This plant will be complete to the last detail, handling wire from raw coil by successive automatic steps to a completed electrode.

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WRITE FOR CATALOGUE

ALTHOUGH specializing in equipment for welding electrode manufacturers and producing plants capable of handling electrodes from coiled stock through to packaged electrodes ready for shipment, **E. P. Moslo** and his organization stand ready to solve problems of the industry in general and welcome the chance to be of service.

✦ ✦ ✦

Diamond Die Concern Moves Into New Quarters

IN order to keep pace with the ever increasing demands upon it for wire drawing dies for war production, Fort Wayne Wire Die, Inc., erected and has moved into a beautiful new plant at 2625 East Pontiac Street, Fort Wayne, Ind., where the Company has greatly improved its plant layout and facilities for production of high-grade diamond wire drawing dies. **Mr. Paul Bieberich**, head of the organization, states that they now have fifty expert die drillers and finishers, with room for further expansion if the demands upon them continue to increase.

✦ ✦ ✦

BESIDES the manufacture of new wire drawing dies, the Company maintains a larger service department where they re-size and polish large numbers of wire drawing dies for their customers, the wire manufacturers, eliminating the necessity of these concerns for maintaining large die service rooms of their own.

✦ ✦ ✦

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WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

ACID INHIBITORS—
American Chemical Paint Co., Ambler, Pa.

ACID JETS AND COILS—
Heil Engineering Co., Cleveland, Ohio.

AIR DRAW FURNACES—
Carl-Mayer Corp., The, Cleveland, Ohio.

ALKALINE CLEANERS—
American Chemical Paint Co., Ambler, Pa.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Rahway, N. J.

ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

BAKERS—Flash
Morrison Engr. Corp., Cleveland, Ohio.

BAKERS—Hi-Speed
Carl-Mayer Corp., The, Cleveland, Ohio.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

BARRELS—Air Blast
Dreisbach Engr. Corp., Yonkers, N. Y.

BENDERS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

BERYLLIUM COPPER — Strip and Bars
Callite Tungsten Corp., Union City, N. J.

BOBBINS—Braider and Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

CABLE REEL BORERS—
Root, B. M., Co., York, Pa.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CASTINGS—Wire Mill
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., The, Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Hand and Metal
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Nukem Products Corporation, Buffalo, N. Y.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

CLOTH TESTERS—
Scott, Henry L., Co., Providence, R. I.

CLOTH—Wire, All Metals
Callite Tungsten Corp., Union City, N. J.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Manufacturing Co., The, Torrington, Conn.

COILS—Steam
Heil Engineering Co., Cleveland, Ohio.

COLD HEADERS—
Ajax Manufacturing Co., Cleveland, Ohio.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Wire Drawing
Oakite Products, Inc., New York, N. Y.
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill

CONTROLS—Heat Treating
Niagara Blower Co., Buffalo, N. Y.

CONTROLS—Temperature
Niagara Blower Co., Buffalo, N. Y.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUSTOM WIRE DRAWING—
Hy-Carbo Steel Co., Lowell, Mass.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Callite Tungsten Corp., Union City, N. J.

DIAMOND POWDERS—
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIE MAKING MACHINERY — For Forming Special Shapes
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

DIES—Diamond
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Fort Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Krause, F., & Co., Hillside, N. J.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Lead Extrusion
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Fort Wayne Wire Die, Inc., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Krause, F., & Co., Hillside, N. J.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIRECT ELECTRIC RESISTANCE HEATING—
Trauwood Engineering Co., Cleveland, Ohio.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING EQUIPMENT—
Niagara Blower Co., Buffalo, N. Y.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Humidifying
Niagara Blower Co., Buffalo, N. Y.

EQUIPMENT—Industrial Cooling
Niagara Blower Co., Buffalo, N. Y.

EQUIPMENT—Insulation Testing
Davis, R. L., Electric Co., Wallingford, Conn.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLASH BAKER—
Morrison Engr. Corp., Cleveland, Ohio.

FLUX—Galvanizing
Dewey & Almy Chemical Co., Cambridge, Mass.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

FURNACES—Annealing
Ajax Electric Co., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Holden, A. F., Co., New Haven, Conn.
Rockwell, W. S., Co., New York, N. Y.
Salem Engineering Co., Salem, Ohio.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Salem Engineering Co., Salem, Ohio.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

WHERE TO BUY, Continued

FURNACES—Electric
Ajax Electric Co., Philadelphia, Pa.
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Salem Engineering Co., Salem, Ohio.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Hardening and Tempering
Ajax Electric Co., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Holden, A. F., Co., New Haven, Conn.
Salem Engineering Co., Salem, Ohio.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
Robertson, John, Co., Brooklyn, N. Y.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Salem Engineering Co., Salem, Ohio.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Salem Engineering Co., Salem, Ohio.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Pot (Oil, Gas and Electric)
Holden, A. F., Co., New Haven, Conn.

FURNACES—Salt Bath
Ajax Electric Co., Philadelphia, Pa.
Electric Furnace Co., Salem, O.
Holden, A. F., Co., New Haven, Conn.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Salem Engineering Co., Salem, Ohio.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING FLUX—
Dewey & Almy Chemical Co., Cambridge, Mass.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—ROLL
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin, Wm. M., Co., The, Pittsburgh, Pa.

JETS—Steam
Heil Engineering Co., Cleveland, Ohio.

KETTLES — Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—
Warner Co., Bellefonte, Pa.

LIQUID FOAM BLANKET—
Dewey & Almy Chemical Co., Cambridge, Mass.

LUBRICANTS—For Metal Cutting Stamping and Drawing
Magnus Chemical Co., Garwood, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY — Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable Reel Boring
Root, B. M., Co., York, Pa.

MACHINERY—Chain Making
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Coilers
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cold Heading
National Machinery Co., Tiffin, Ohio.

MACHINERY—Cold Heading with Wire Drawing Attachment
Ajax Manufacturing Co., The, Cleveland, O.

MACHINERY—Copper Wire Drawing and Rolling
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Ajax Manufacturing Co., The, Cleveland, O.
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.

MACHINERY — Die Making for Forming Special Shapes
O'Neil-Irwin Mfgr. Co., Minneapolis, Minn.

MACHINERY—Draw Benches
Ajax Manufacturing Co., The, Cleveland, O.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
National Erie Corp., Erie, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Galvanizing Wire
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Galvanizing
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Davis, R. L., Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Brockton, Mass.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

WHERE TO BUY, Continued

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Superior Tool & Mfg. Co., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Quill Winding
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
National Erie Corp., Erie, Pa.
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Superior Tool & Mfg. Co., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Emory, Robert J., Co., Newark, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Ajax Manufacturing Co., The, Cleveland, O.
Broden Construction Co., Cleveland, O.
Hallden Machine Co., The, Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Superior Tool & Mfg. Co., Worcester, Mass.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

Machinery—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Amthor Testing Instrument Co., Brooklyn, N. Y.
Robinson Mfg. Co., Muncy, Pa.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Davis, R. L., Electric Co., Wallingford, Conn.

MACHINERY—Testing—Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
Shuster, F. B., Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
Ajax Manufacturing Co., The, Cleveland, O.
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Superior Tool & Mfg. Co., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Brockton, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

METAL CLEANING—Dry Process
Dreisbach Engr. Corp., Yonkers, N. Y.

MILLS—Metal Reclaiming
Dreisbach Engr. Corp., Yonkers, N. Y.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER—Insulating
Manning, John A., Paper Co., Troy, N. Y.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COILS AND JETS—Steam
Heil Engineering Co., Cleveland, Ohio.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M., Co., The, Pittsburgh, Pa.

PICKLING TANK LININGS—
Keagler Brick Co., Steubenville, Ohio.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Richards, G. Whitfield, Philadelphia, Pa.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

WHERE TO BUY, Continued

PULLERS—Wire
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

QUENCHING BATH CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery Co., Cleveland, Ohio.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Morrison Engr. Corp., Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
American Brass Co., The, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Wheeling Steel Corp., Wheeling, W. Va.
Wickwire Spencer Steel Co., New York, N. Y.

ROLL STRAIGHTENERS—
Moslo Machinery Co., Cleveland, Ohio.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Heil Engineering Co., Cleveland, Ohio.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STEAM COILS & JETS—For Acid Tanks
Heil Engineering Co., Cleveland, Ohio.

STRIP—Brass and Non Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Seneca Wire & Mfg. Co., The, Fostoria, O.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANK LININGS—Brick
Keagler Brick Co., Steubenville, Ohio.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Heil Engineering Co., Cleveland, Ohio.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TEMPERATURE CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Amthor Testing Instrument Co., Brooklyn, N. Y.
Scott, Henry L., Co., Providence, R. I.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VALVES AND FITTINGS—Acid Resistant

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y. Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Wheeling Steel Corp., Wheeling, W. Va.

WIRE DRAWING — High Grade Custom
Hy-Carbo Steel Co., Lowell, Mass.

WIRE—Electric
American Brass Co., The, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Seneca Wire & Mfg. Co., The, Fostoria, O.
Spencer Wire Co., Spencer, Mass.
Wheeling Steel Corp., Wheeling, W. Va.
Wickwire Bros., Inc., Cortland, N. Y.
Wickwire Spencer Steel Co., New York, N. Y.

WIRE—Music
Harris, F. A., Inc., Springfield, Mass.
Jersey Steel & Wire Corp., Irvington, N. J.

WIRE—Nickel Silver and Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
American Brass Co., The, Waterbury, Conn.
Callite Tungsten Corp., Union City, N. J.
Harris, F. A., Inc., Springfield, Mass.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
American Brass Co., The, Waterbury, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Harris, F. A., Inc., Springfield, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Seneca Wire & Mfg. Co., The, Fostoria, O.
Wickwire Spencer Steel Co., New York, N. Y.

WIRE—Stainless Steel
Callite Tungsten Corp., Union City, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Harris, F. A., Inc., Springfield, Mass.
Spencer Wire Co., Spencer, Mass.
Wickwire Spencer Steel Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Seneca Wire & Mfg. Co., The, Fostoria, O.
Spencer Wire Co., Spencer, Mass.
Wheeling Steel Corp., Wheeling, W. Va.
Wickwire Bros., Inc., Cortland, N. Y.
Wickwire Spencer Steel Co., New York, N. Y.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non Ferrous
American Brass Co., The, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Crepeu
Crepe-Kraft Co., Newark, N. J.

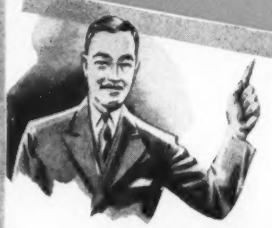
YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

Custom built spools for high speed winding

Mercury testing for continuity of film

Checking raw materials

Don't "fool around"... USE DEPENDABLE WIRE PRODUCTS!



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Hudson Wire products, designed for discriminating manufacturers, has just such a reputation in the fine wire field. Offering greater flexibility and tensile strength, perfect laying at higher speeds, new coating methods and reduced coil dimensions without sacrificing electrical values, Hudson Wire products will probably lower your production costs considerably. Check these three points:

QUALITY— All phases of manufacture, from ingot to final processing, are carefully supervised and fulfilled in the same manner you would carry out in your own plant. There are no unimportant phases in the work.

UNIFORMITY — By mercury process tests, our engineers can guarantee perfect uniformity in wire; from the smallest to the largest order. No more variations in consistency, structure or electrical properties . . . every inch of wire exactly as specified, more than meeting your requirements.

SERVICE—If you have a wire problem, our complete design and engineering facilities are at your disposal without obligation. Send your specifications and blueprints for our recommendations; or if you are not quite ready, write for samples of these quality products.

Enameled Copper, Enameled Iron, Enameled Alloy, Enameled Aluminum, Silk Covered, Cotton Covered, Celanese Covered, Glass Fibre Covered, Twisted Multiples, Parallel Multiples and Litzendraht.

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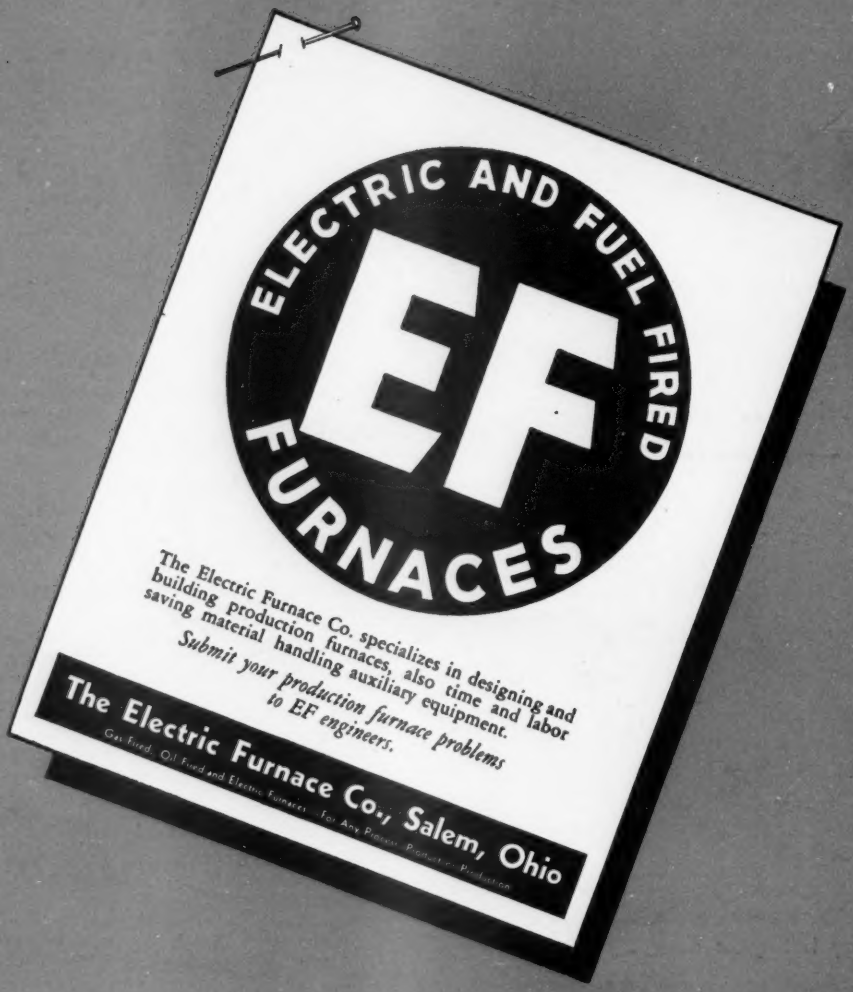
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